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THE
REPTILE BOOK
BY
RAYMOND L. DITMARS



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DIAMOND RATTLESNAKE. *Crotalus adamanteus*. A bite from the Diamond Rattlesnake is usually fatal, and there are records of death within half an hour after the injury. The species reaches a length of 8 feet. It is found in the southeastern portion of the United States, being especially numerous in Georgia and Florida.

Largest of the North American poisonous serpents and second to few of the venomous snakes of the world in point of deadliness. A bite from the Diamond Rattlesnake is usually fatal, and there are records of death within half an hour after the injury. The species reaches a length of 8 feet. It is found in the southeastern portion of the United States, being especially numerous in Georgia and Florida.

THE ALLIGATOR

A COMPREHENSIVE, PICTORIAL
WORK ON THE SURVIVAL AND
HABITS OF THE CROCODILIAN
CROCODILIANS, LIZARDS, AND
WHICH INHABIT THE SWAMP
STATES AND NORTHERN MISSISSIPPI

BY

RAYMOND LEE DENTON

Curator of Reptiles and Fish, New York Zoo

EIGHT PLATES IN COLOUR AND SEVEN
FOUR HUNDRED PHOTOGRAPHS IN ALL

THE
NEW YORK
ZOO
PUBLISHED
BY THE
NEW YORK ZOO

NEW YORK

JOHN J. HAY, PUBLISHER & COMPANY

1942

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DOUBLEDAY, PAGE & COMPANY
Published, March, 1907

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To My Wife

TO WHOM ALL CREDIT IS DUE
FOR PROVIDING ME WITH THAT GREATEST OF REQUISITES
THE AMBITION TO ATTEMPT A GREAT TASK,
THIS WORK IS DEDICATED

ACKNOWLEDGMENTS

It is difficult, in type, to express my sincere appreciation for the hearty assistance I have received, in the preparation of this work.

To Director William T. Hornaday, of the New York Zoölogical Park, I wish to express my thanks and esteem, for his encouragement and suggestions. The most pleasant period of my life, has been the seven years past, spent in the Zoölogical Park in charge of the collection of reptiles. Nowhere else but in a reptile house like that erected by the New York Zoölogical Society, could one find such opportunities to observe reptiles at their best. A number of the photographs are of specimens that have been exhibited at the Park.

My thanks are also extended to Dr. Leonhard Stejneger, Curator of Reptiles, at the United States National Museum for assistance in the identification of specimens.

To Director Arthur Erwin Brown, of the Philadelphia Zoölogical Gardens, I am indebted for much helpful advice.

For courtesies that have been valuable in the preparation of this book, I wish to thank Dr. Samuel Garman and Mr. Thomas Barbour, in relation to reptiles at the Museum of Comparative Zoölogy, at Cambridge, Massachusetts. Through the coöperation of these gentlemen, photographs of a number of very rare species were procured.

To the following gentlemen I also wish to extend my thanks:

Mr. C. S. Brimley, Raleigh, North Carolina; Dr. John Van Denburgh, San Francisco, Calif.; Mr. Herbert Lang, Am. Mus. of Nat. Hist., New York; Mr. Morris Pearsall, New York; Mr. Adam Dove, New York; Mr. Otto Eggling, New York; Mr. Witmer Stone, Academy of Natural Sciences, Philadelphia, Pa.; Prof. E. L. Moseley, Sandusky, Ohio.

In conclusion I wish to express my obligations to Keepers Charles Snyder and John Toomey, of the Reptile House, in the New York Zoölogical Park.

New York

RAYMOND L. DITMARS.

PREFACE

IN THE great procession of zoölogical events, we find elaborate representations of all the branches of animate creation but that of reptiles. Occasionally, a technical work passes before the eager student, but its phraseology and complication fail to attract and it finds its way only to the library of the great institutions where it remains as a reference for a scientific few. The shelves of our libraries groan with masses of literature upon mammals, birds, fishes, insects and the lower forms of life—literature of a kind that may be comprehended by the Great Majority, but the gap—in the scale of classification between the birds and the fishes—has steadily remained unchanged. The descriptions of reptiles in the works of general natural history, excellent though they may be, are mere bird's-eye views of a great subject. The works of the technical writers, voluminous enough, are imperatively necessary in the records of Science, but pure science is so far over the head of the average student, that without proper steps to reach it—popularised books—he would never know the reason for which it was created. But one condition can bring about more general knowledge and interest in the great Class of Reptiles and that is the special treatment of structure and habits in a manner sympathetic to the needs of the Many, who crave to learn.

In the present work the writer has sought to compile a popular review of a great fauna—the Reptiles of North America. He has excluded technical phraseology and tried to produce two results: 1. A popular book, that may be comprehended by the beginner and 2—A book valuable in its details to the technical worker. Though some scientists scoff at all language except that which is obscure to everybody but themselves, I feel sure that to even that Few, this book will be of interest, for the illustrations alone tell the story.

My friend the Camera: Through the several years of preparation of this book, my most useful ally has been a camera.

Preface

All of the illustrations of the reptiles themselves, are photographic; every photograph, of this large series, is an original. The illustrations were procured under the most varied conditions, but most of them are exposures of from one to five seconds, and were taken through a ray filter. With the exception of six illustrations* (of turtles), all of the photographs were taken by the writer.

My camera has worked hard and faithfully and the details of structure have been fully portrayed, but in a work like this, *colour value* in the pattern is of great importance, and here the camera has its limitations, though assisted by the ray filter and colour-sensitive plates. A great amount of work was done upon the negatives themselves, and in this, the use of restraining dyes formed an important part; some of the developed plates were put through a half-dozen processes before they passed a satisfactory test. Those illustrations of snakes that are blotched or ringed with scarlet (a difficult problem for the camera) are good examples of the final result.

*For these I am indebted to Mr. Herbert Lang.

INTRODUCTION

THROUGHOUT this work the writer has tried to assist the beginner—yet he feels that he has left out little that will interest the technical worker. He believes that the trend of scientific publications should be more in this direction. Let us consider but one argument, and that in relation to the study of reptiles. Suppose an intelligent farmer, with an inclination for the study of popular natural history, should find a snake upon his lands, and, wishing to find whether it was harmless or poisonous, opens a strictly scientific book, dealing with North American reptiles. What does he find? Elaborate descriptions of anatomical characters, many of these *internal*, and these descriptions under technical headings, each followed by a long list of synonyms and often a lengthy debate as to the former classification by other scientists than the author; about the only popular words in the description, are the articles “the” and “a”; even the colours are defined in intricate fashion. To this man, such a book is useless. He has no time to master the bewildering, new language he has discovered, so is unable to learn whether the snakes living on his farm are harmless or dangerous, beneficial or otherwise.

In preparing the descriptions, the writer has excluded complicated references to structure. Of these characters, his valuable assistant, the camera, has described intricate details far better than if such were put in type; in fact, many of the species need little description beyond that of their *colours* and *size*, as the photograph of the animal and the attendant illustrations of the head (above and from the side) show most of the features of the structure and pattern.

Use of scientific names.—The practice of often changing generic names, simply according to the ideas of this or that authority, is very confusing to any but the advanced student and adds to the steadily increasing list of synonyms. The writer has made no attempt to *discuss* the alleged good-standing of

Introduction

generic names, but has uniformly adopted technical names that have been well established. Thus there will be no lists of synonyms in this book. His policy has been to devote more time in preparing a popular presentation of his subject, than to add another, to the many searches for "priority."

Following is an example of a title, and its different parts:

PIGMY RATTLESNAKE, *a*

Sistrurus miliarius, (Linn.), *b*

a.—The popular name.

b.—The technical name and authority.

The *parts* of the technical or scientific name may be described thus:

Sistrurus a. miliarius, b. (Linn.) c

a.—The generic name.

b.—The specific name.

c.—The authority.

In strictly scientific writings, the placing of the name of the authority in a parenthesis, signifies that the name of the genus has been changed from that in which the species was placed in the original description.

Under the head of scientific names comes another subject. This is discrimination in the *recognition* of species and sub-species—varieties. In a purely scientific book, those species and varieties that have been rejected as doubtful, or forming mere varietal phases of well-established species, are placed in the list of synonyms, beneath the name; relating to their rejection is usually an argument, explaining the cause of their exclusion. As this is a subject that will interest the technical herpetologist only, we will pass it with the explanation that such lists have not been treated in this work, and the final result of the writer's discrimination stands illustrated in the array of those species and varieties (sub-species) that have been recognised.

System of measurement.—Nearly every description has a table of measurements; these lists have been prepared in uniform style throughout; most of them stand as *average* dimensions, taken from a series of specimens.

The measurements of the length and width of shells of

Introduction

the turtles, are on a straight line (not following the curve of the shell) and were made with calipers in the fashion shown, in miniature, in the illustration. In procuring the width and length of the head; the width of a lizard's body or the *greatest diameter* of a snake's body, the calipers were necessarily employed. The length of a serpent's head is from the tip of the snout to the back of the bulge, behind the mouth; by running the finger nail along the neck, near the base of the head, the junction of the jaw-bones may be felt; this is the end of the head. (See illustration). The width of the head, is always the *widest* part.

"*Size.*"—In the descriptive matter will be found the designations, "very small," "small," "moderate" and "large." At the beginning, these sizes should be understood.

Any of our fresh-water turtles having a shell 10 to 12 inches long, are designated as large species; a small species has a shell from 2 to 4 inches long.

Lizards under 5 inches in length are *small*; those between 5 and 10 inches long are of moderate size; over 10 inches, they are of large size—for North American lizards.

A snake under 14 inches long is small; over 14 inches and up to 3½ feet might it be described as of moderate size; serpents over 3½ feet long are large among the species embraced in this work.

References to structure.—In a few of the descriptions, concise reference has been made to certain parts of the structure; the resulting terms would be confusing without explanation and figures.

Turtles.—The upper shell is known as the *Carapace*; the lower one as the *Plastron*. For the sake of convenience, these terms have been frequently used.

Lizards.—As some of the species are more readily separated in the keys by using the arrangement of the head shields as distinguishing features, the student should have a general idea of the situation of the more important head-plates in case there be reference to such. (See illustration.)

Snakes.—The serpents, being scaled reptiles, fall under much the same form of description as the lizards, and a general idea of the head-plates should be acquired. (See illustration.)

Introduction

With both snakes and lizards the character of the scales of the upper surfaces, is important. The scales may be smooth or *keeled* (carinated); in the latter case, weakly or heavily keeled. A keeled scale has a distinct, line-like keel running from its base to the tip.

Some of the lizards have a very fine, granular scalation above and large, square shields on the abdomen; others have large, keeled scales above and smaller scales on the under-surface. Many have the head plated, like the snakes; others have small scales on the top of the head. Such details of structure are easily understood and largely employed in the descriptions.

It should be noted that the body scales of a snake are arranged in symmetrical, *oblique* rows, from one side of the abdomen to the other; the abdomen is covered with a single row of broad plates. By counting the scales in one of the rows, on the upper surface, we have another important point to be used in identification.

The pupil of the eye of snakes or lizards, may be *round* or *elliptical*: this should be noted.

Little more can be said by way of explanation. Preceding each Part of the work is a classified list showing the arrangement of families, genera and the number of species of North American reptiles in each of the genera. Preceding the description of each list of species of the various genera, is a key to those species. Thus the way is paved, step by step, to assist the beginner.

Before examining the succeeding chapters, it is interesting to get a bird's-eye view of the subject involved.

The Class Reptilia is represented in North America by four Orders given below:

The CHELONIA—Turtles and Tortoises.

The CROCODYLIA—Crocodilians.

The LACERTILIA—Lizards.

The OPHIDIA—Snakes.

The total number of North American species of these Orders, is 254. Of these 44 are Chelonians, 2 are Crocodilians, 97 are Lizards and 111 Snakes.

CONTENTS

ACKNOWLEDGMENTS	vii
PREFACE	ix
INTRODUCTION	xi

PART I: THE TURTLES AND TORTOISES

Order *CHELONIA*

CHAPTER		PAGE
I.	CLASSIFICATION OF THE NORTH AMERICAN TURTLES AND TORTOISES	3
II.	THE SEA TURTLES; Families <i>Spargidae</i> and <i>Chelonidae</i> Largest of the Chelonians. These Strictly Aquatic Reptiles May be Recognised by their Seal-like Flippers	4
III.	THE SNAPPING TURTLES; Family <i>Chelydridæ</i> A Small Family, Composed of Three Large and Powerful Species	11
IV.	THE MUSK OR MUD TURTLES; Family <i>Cinosternidae</i> The Genera <i>Aromochelys</i> and <i>Cinosternum</i> , Composed of Small and Thoroughly Aquatic Species, the Majority Inhabiting North America	17
V.	THE TERRAPINS; The Genera <i>Cbrysemys</i> , <i>Malacoclemmys</i> , and <i>Chelopus</i> . Family <i>Testudinidae</i> . A Group of Aquatic Chelonians Known Commonly as Pond Turtles and River Turtles. They are Characterised by their Broad, Flat Shell. Most of the Species are Edible	28
VI.	THE BOX TURTLES; Genera <i>Emys</i> and <i>Cistudo</i> Turtles with Divided, Hinged Plastrons—Descriptions of the Species—Their Habits	54
VII.	THE TORTOISES; Genus <i>Testudo</i> Strictly Terrestrial Chelonians. Represented in North America by Three Species	65

Contents

CHAPTER	PAGE
VIII. THE SOFT-SHELLED TURTLES; Genus <i>Trionyx</i> . Family <i>Trionychidæ</i> Strongly Characteristic Chelonians, with a Soft, Leathery Shell	72

PART II: THE CROCODILIANS

Order CROCODILIA

IX. THE CROCODILIANS; Order <i>Crocodylia</i> An Order Represented by Two Species in the United States—The American Crocodile and the Alligator	83
--	----

PART III: THE LIZARDS

Order LACERTILIA

X. THE LIZARDS Classification of North American Lizards	95
XI. THE GECKOS; Families <i>Geckonidæ</i> and <i>Eublepharidæ</i> A Large Group of Granular-scaled Lizards, Represented by Four Species in North America	97
XII. THE AMERICAN CHAMELEON; Genus <i>Anolis</i> The North American Representative of a Large, New World Genus of Lizards that are Remarkable in the Habit of Frequently Changing their Colours	102
XIII. THE IGUANAS Large Species that May be Recognised by their Fine Scalation and Spine-like Crest.	106
XIV. THE GENERA <i>Sauromalus</i> AND <i>Crotaphytus</i> . Fine-scaled Representatives of the <i>Iguanidæ</i>	111
XV. THE SPOTTED LIZARDS; ZEBRA-TAILED LIZARDS Small and Strictly Terrestrial Species of the Genera <i>Callisaurus</i> , <i>Uma</i> , and <i>Holbrookia</i>	116
XVI. THE SWIFTS Two Genera— <i>Uta</i> and <i>Sceloporus</i> —Small, Rough- scaled Lizards	122

Contents

CHAPTER	PAGE
XVII. THE HORNED LIZARDS; Genus <i>Pbrynosoma</i> A Genus of Lizards that are Most Commonly Known as the Horned "Toads"	143
XVIII. THE PLATED LIZARDS AND SNAKE-LIKE SPECIES The Families <i>Anguidæ</i> and <i>Aniellidæ</i> , Embracing the North American Genera <i>Gerrhonotus</i> — Plated Lizards, <i>Ophisaurus</i> —Glass "Snake" and <i>Aniella</i> —Ground "Snake"	160
XIX. THE BEADED LIZARDS; Family <i>Helodermatidæ</i> A Family Composed of but Two Species—The Gila Monster and the Mexican Beaded Lizard— Both of the Genus <i>Heloderma</i> . Descriptions of the Species—Their Habits	169
XX. THE FAMILY <i>Xantusiidæ</i> A Small Family of Diminutive Lizards—Five Species Inhabit Southwestern North America	178
XXI. THE STRIPED LIZARDS OR "RACE RUNNERS"; Family <i>Teiidæ</i>—Genus <i>Cnemidophorus</i>	184
XXII. THE WORM-LIKE LIZARDS The Families <i>Euchirotidæ</i> and <i>Amphisbænidæ</i> , Embracing the Most Degenerate of the Liz- ards—Descriptions of the North American Species	190
XXIII. THE SKINKS OR SMOOTH-SCALED LIZARDS; Family <i>Scincidæ</i> Small, Glossy-scaled Lizards of a Large Family, Represented in North America by Two Genera and Fifteen Species	195

PART IV: THE SNAKES

Order *OPHIDIA*

XXIV. CLASSIFICATION OF THE NORTH AMERICAN SNAKES	207
XXV. THE BLIND SNAKES; Family <i>Glauconiidæ</i>, AND THE DWARF BOAS; Family <i>Boidæ</i> A Few Northern Representatives of Tropical Families.	209

Contents

CHAPTER	PAGE
XXVI. THE STRIPED SNAKES—GARTER SNAKES; Genus <i>Eutania</i> A Genus of North American Snakes that are Noted for their Abundance and the Great Variation of Pattern Among Some of the Species—Key to the Identification of Species —Detailed Descriptions—Keys to the Identification of Varieties—Habits	213
XXVII. THE WATER SNAKES; Genus <i>Tropidonotus</i> A Large Genus of Semi-aquatic Serpents that Occur in both the Eastern and Western Hemispheres—Descriptions of the North American Species—Their Habits	241
XXVIII. SMALL, MISCELLANEOUS KEELED-SCALED SERPENTS; Genera <i>Clonophis</i> , <i>Tropidoclonium</i> , <i>Seminatrix</i> , and <i>Liodytes</i>	261
XXIX. THE BROWN SNAKES Small and Secretive Species, Representing the Genera <i>Storeria</i> , <i>Haldea</i> , <i>Amphibardis</i> , and <i>Virginia</i>	266
XXX. THE RACERS; Genera <i>Spilotes</i> and <i>Zamenis</i> Large Non-constricting Serpents, Characterised by their Great Agility	274
XXXI. THE FLAT-NOSED SNAKES; Genera <i>Salvadora</i> and <i>Phyllorhynchus</i> Unique Serpents of the Southwestern United States and Mexico	291
XXXII. THE RAT SNAKES OR COLUBERS; Genus <i>Coluber</i> Large and Powerful Constricting Serpents. They are of Considerable Economic Value in Destroying Animals that are Injurious to Agricultural Pursuits	294
XXXIII. THE BULL SNAKES; Genus <i>Pituophis</i> Large Constricting Snakes that are Closely Allied to the Rat Snakes—Descriptions of the Three North American Species—Their Habits	315

XXXIV.	THE GREEN SNAKES Representatives of the Genera <i>Cyclopbis</i> and <i>Liopeltis</i> —Small Serpents that are of a Uniform, Pale Green Above, and thus Characteristic Among North American Snakes	322
XXXV.	SMALL, MISCELLANEOUS SMOOTH-SCALED SER- PENTS; Genera <i>Hypsiglena</i> , <i>Stilosoma</i> , <i>Rhadi- nea</i> , and <i>Contia</i>	327
XXXVI.	THE RING-NECKED SNAKES; Genus <i>Diadophis</i> Small, Smooth-scaled Serpents with Char- acteristic Markings	333
XXXVII.	THE KING SNAKES; Genus <i>Ophibolus</i> Smooth-scaled Constricting Serpents of Small, Medium and Large Size, which Derive the Popular Title from their Habit of Killing and Eating Both Harmless and Venomous Snakes	339
XXXVIII.	THE RAINBOW SNAKES Large and Brilliantly Coloured, Burrowing Serpents, of the Genera <i>Abastor</i> and <i>Farancia</i>	365
XXXIX.	THE SHARP-NOSED SNAKES; Genera <i>Carpbo- pbis</i> , <i>Ficimia</i> , <i>Chilomeniscus</i> , <i>Cemophora</i> , and <i>Rhinocbilus</i> Small, Burrowing Species, with Smooth Scales	369
XL.	THE HOG-NOSED SNAKES; Genus <i>Heterodon</i> Three North American Species that are Inter- esting from their Peculiar Form and Habits	377
XLI.	THE OPISTHOGLYPH SNAKES OF NORTH AMERICA A Division of Mildly Poisonous Serpents, with Grooved Fangs in the Rear of the Upper Jaw—The Many Species Occur in Both the Eastern and the Western Hemispheres	386
XLII.	THE ELAPINE POISONOUS SNAKES; Sub-family <i>Elapinae</i> A Large Sub-family of the <i>Colubridae</i> , Embracing the Old World Cobras and their Allies,	

Contents

CHAPTER	PAGE
and the American Coral Snakes—Résumé of the <i>Elapinae</i> —Descriptions of the North American Species—Their Habits	392
XLIII. THE VIPERINE SNAKES; Family <i>Viperida</i> The Thick-bodied Poisonous Snakes of the New World—Serpents Distinguished by their Long Fangs, which Fold Against the Roof of the Mouth when it is Closed	403
XLIV. THE MOCCASINS; Genus <i>Ancistrodon</i> Descriptions of the Species—Their Habits	414
XLV. THE RATTLESNAKES Poisonous Snakes of Two Genera— <i>Sistrurus</i> and <i>Crotalus</i> —That are Unique Among Serpents in the Possession of the Rattle	426
INDEX	467

LIST OF COLOUR PLATES

PLATE

i.	DIAMOND RATTLESNAKE, <i>Crotalus adamanteus</i> . Largest of the North American Poisonous Serpents and Second to Few of the Venomous Snakes of the World in Point of Deadliness . . .	Frontispiece
FACING PAGE		
xii.	EASTERN PAINTED TURTLE, <i>Chrysemys picta</i> .	32
	WESTERN PAINTED TURTLE, <i>Chrysemys marginata</i> .	32
xv.	YELLOW-BELLIED TERRAPIN, <i>Chrysemys scabra</i> .	40
	CUMBERLAND TERRAPIN, <i>Chrysemys elegans</i> .	40
xxx.	ALLIGATOR, <i>Alligator mississippiensis</i> . . .	88
	AMERICAN CROCODILE, <i>Crocodilus americanus</i> .	88
xxxvii.	COLLARED LIZARD, <i>Crotaphytus collaris</i> . . .	114
	LEOPARD LIZARD, <i>Crotaphytus wislizenii</i> . . .	114
liv.	GILA MONSTER, <i>Heloderma suspectum</i> . The only Poisonous Lizard Inhabiting the United States	172
cv.	MILK SNAKE, <i>Ophibolus doliatus triangulus</i> . (New York)	339
	SOUTHERN MILK SNAKE, <i>Ophibolus doliatus clericus</i> . (Maryland)	339
	SCARLET KING SNAKE, <i>Ophibolus doliatus coccineus</i> . (Florida)	339
cxviii.	HARLEQUIN SNAKE; CORAL SNAKE, <i>Elaps fulvius</i> .	402
	SONORAN CORAL SNAKE, <i>Elaps euryxanthus</i> . . .	402

LIST OF HALF-TONE ILLUSTRATIONS

PART I: THE TURTLES AND TORTOISES

Order CHELONIA

PLATE		FACING PAGE
ii.	TRUNK TURTLE, <i>Spargis coriacea</i> . Largest of the Marine Turtles	6
	LOGGERHEAD TURTLE, <i>Thalassochelys caretta</i>	6
iii.	GREEN TURTLE, <i>Chelonia mydas</i> . Esteemed as an Article of Diet	7
	HAWK'S-BILL TURTLE, <i>Chelonia imbricata</i> . Valuable for its "Tortoise Shell"	7
iv.	YOUNG LOGGERHEAD TURTLES, <i>Thalassochelys caretta</i>	10
	Plastrons of LOGGERHEAD, GREEN, HAWK'S-BILL and TRUNK Turtles	10
v.	Eggs of the ARIZONA MUD TURTLE, <i>Cinosternum henrici</i>	11
	Newly Hatched MUSK TURTLES, <i>Aromochelys odoratus</i>	11
	Eggs of the SPOTTED TURTLE, <i>Chelopus guttatus</i>	11
	A Yearling MUSK TURTLE, <i>A. carinatus</i>	11
	Very Young BOX TURTLE, <i>Cistudo carolina</i>	11
	A Young GOPHER TORTOISE, <i>Testudo polyphemus</i>	11
vi.	Common SNAPPING TURTLE, <i>Chelydra serpentina</i>	12
	Young SNAPPING TURTLE, <i>Chelydra serpentina</i>	12
vii.	ALLIGATOR SNAPPING TURTLE, <i>Macrochelys lacertina</i>	
	Reaches a Weight of 140 Pounds	13
	Head of the ALLIGATOR TURTLE, <i>Macrochelys lacertina</i>	
	Could readily amputate a man's hand or foot	13
viii.	Common MUSK TURTLE, <i>Aromochelys odoratus</i>	22
	Southern MUSK TURTLE, <i>Aromochelys tristycha</i>	22
ix.	KEELED MUSK TURTLES, <i>Aromochelys carinatus</i>	23
	Common MUD TURTLE, <i>Cinosternum pennsylvanicum</i>	23
x.	LOUISIANA MUD TURTLE, <i>Cinosternum louisianæ</i>	26
	BANDED MUD TURTLE, <i>Cinosternum bauri</i>	26

List of Half-tone Illustrations

PLATE		FACING PAGE
xi.	YELLOW-NECKED MUD TURTLE, <i>Cinosternum flavescens</i>	27
	ARIZONA MUD TURTLE, <i>Cinosternum henrici</i> . Largest of the North American Mud Turtles . . .	27
xiii.	BELL'S TERRAPIN, <i>Cbrysemys belli</i> . . .	34
	CHICKEN TURTLE, <i>Cbrysemys reticulata</i> . . .	34
xiv.	Young Specimens of PAINTED TERRAPIN, FLORIDA TERRAPIN, LESUEUR'S TERRAPIN, and WOOD and SPOTTED TURTLES . . .	35
xvi.	TROOST'S TERRAPIN, <i>Cbrysemys troosti</i> . Sold Under the General Title of "Sliders" . . .	46
	Young of the YELLOW-BELLIED TERRAPIN, <i>Cbrysemys scabra</i> . . .	46
xvii.	Young FLORIDA TERRAPIN, <i>Cbrysemys floridana</i> . . .	47
	FLORIDA TERRAPIN, Adult . . .	47
xviii.	GEOGRAPHIC TERRAPIN, <i>Malacoclemmys geographica</i> . . .	50
	LESUEUR'S TERRAPIN, <i>Malacoclemmys lesueurii</i> . . .	50
xix.	DIAMOND-BACK TERRAPIN, <i>Malacoclemmys palustris</i>	51
	WOOD TURTLE, <i>Chelopus insculptus</i> . Protected from Capture in New York . . .	51
xx.	SPOTTED TURTLE, <i>Chelopus guttatus</i> . . .	62
	MUHLENBERG'S TURTLE, <i>Chelopus mublenbergii</i> . . .	62
xxi.	BLANDING'S TURTLE; SEMI-BOX TURTLE, <i>Emys blandingii</i> . . .	63
	PAINTED BOX TURTLE, <i>Cistudo ornata</i> . . .	63
	Common BOX TURTLE, <i>Cistudo carolina</i> . . .	63
xxii.	THREE-TOED BOX TURTLE, <i>Cistudo triunguis</i> . . .	64
	BAUR'S BOX TURTLE, <i>Cistudo bauri</i> . . .	64
xxiii.	GOPHER TORTOISE, <i>Testudo polyphemus</i> . . .	65
xxiv.	DESERT TORTOISE, <i>Testudo agassizii</i> . . .	68
	Plastron of the DESERT TORTOISE . . .	68
xxv.	BERLANDIER'S TORTOISE, <i>Testudo berlandieri</i> . . .	69
	Plastron of BERLANDIER'S TORTOISE . . .	69
xxvi.	Eggs of <i>Trionyx spinifer</i> . . .	76
	Head of <i>Trionyx spinifer</i> . . .	76
	Front of Carapace, SPINY SOFT-SHELLED TURTLE, <i>Trionyx spinifer</i> . . .	76
	Young of the SOUTHERN SOFT-SHELLED TURTLE, <i>Trionyx ferox</i> . . .	76

List of Half-tone Illustrations

PLATE		FACING PAGE
xxvii.	SOUTHERN SOFT-SHELLED TURTLE, <i>Trionyx ferox</i>	77
	BROWN SOFT-SHELLED TURTLE, <i>Trionyx muticus</i>	77
xxviii.	SPINY SOFT-SHELLED TURTLE, <i>Trionyx spinifer</i>	80
	SPINY SOFT-SHELLED TURTLE, From Beneath	80

PART II: THE CROCODILIANS

Order CROCODILIA

xxix.	THE HOME OF THE ALLIGATOR. An Inlet of the Savannah River	81
	EGGS OF THE ALLIGATOR	81

PART III: THE LIZARDS

Order LACERTILIA

xxx.	METHODS OF MEASURING TURTLES, SNAKES, LIZARDS, AND SERPENTS	98
xxxii.	SCALATION OF THE HEAD. Snake and Lizard	99
xxxiii.	REEF GECKO, <i>Sphaerodactylus notatus</i> . The Only True Gecko Found in the United States	110
	BANDED GECKO, <i>Eublepharis variegatus</i>	110
	AMERICAN CHAMELEON, <i>Anolis carolinensis</i>	110
xxxiv.	IGUANA, <i>Cyclura carinata</i>	111
	DESERT IGUANA, <i>Dipsosaurus dorsalis</i>	111
xxxv.	CHUCKAWALLA, <i>Sauromalus ater</i>	112
xxxvi.	SAND LIZARD, <i>Uma notata</i>	113
	ZEBRA-TAILED LIZARD, <i>Callisaurus draconoides</i>	113
	SPOTTED LIZARD, <i>Holbrookia maculata</i>	113
xxxviii.	STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS	116
xxxix.	BREEDING HABITS OF LIZARDS	117
xl.	STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS	118
xli.	STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS	119
xlii.	STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS	124

List of Half-tone Illustrations

PLATE	PACING PAGE
xliii. STANSBURY'S SWIFT, <i>Uta stansburiana</i> . . .	125
WHITE-BELLIED SWIFT, <i>Uta symmetrica</i> . . .	125
CLARK'S SWIFT, <i>Sceloporus clarkii</i> . . .	125
xliv. COMMON SWIFT; FENCE LIZARD, <i>Sceloporus undulatus</i> . SPINY SWIFT; TEXAS SWIFT, <i>Sceloporus spinosus</i> . . .	128
PACIFIC SWIFT, <i>Sceloporus undulatus occidentalis</i> .	128
BANDED SWIFT, <i>Sceloporus undulatus consobrinus</i> .	128
xlv. WESTERN SWIFT, <i>Sceloporus biserialatus</i> . . .	129
COLLARED SWIFT, <i>Sceloporus torquatus poinsettii</i> . The Finest Species of its Genus. . .	129
xlvi. HEADS OF HORNED LIZARDS, <i>Pbrynosoma</i> . . .	144
xlvii. DOUGLASS'S HORNED LIZARD, <i>Pbrynosoma douglassii</i> . . .	145
PAINTED HORNED LIZARD, <i>P. douglassii ornaticissimum</i> . . .	145
HERNANDEZ'S HORNED LIZARD, <i>P. douglassii bernandesi</i> . . .	145
xlviii. DITMARS'S HORNED LIZARD, <i>Pbrynosoma ditmarsii</i> .	148
MEXICAN HORNED LIZARD, <i>Pbrynosoma orbiculare</i> .	148
x'ix. REGAL HORNED LIZARD, <i>Pbrynosoma regale</i> . . .	149
PACIFIC HORNED LIZARD, <i>Pbrynosoma coronatum</i> .	149
I. TEXAS HORNED LIZARD, <i>Pbrynosoma cornutum</i> . Commonest and Most Widely Distributed of the Horned Lizards. . .	156
ASHY HORNED LIZARD, <i>Pbrynosoma calidiarum</i> .	156
ii. KEELED LIZARD, <i>Gerrhonotus multicarinatus</i> . . .	157
LONG-TAILED EXAMPLE OF THE KEELED LIZARD, <i>Gerrhonotus multicarinatus</i> . . .	157
lii. BROWN LIZARD, <i>Gerrhonotus liocephalus</i> . . .	160
KING'S LIZARD, <i>Gerrhonotus kingii</i> . The Most Brightly Coloured Member of its Genus. .	160
liii. PLATED LIZARD, <i>Gerrhonotus imbricatus</i> . . .	161
GLASS "SNAKE," <i>Ophisaurus ventralis</i> . . .	16

List of Half-tone Illustrations

PLATE	PACING PAGE
IV. SIX-LINED LIZARD; RACERUNNER, <i>Cnemidophorus sexlineatus</i> . The Smallest Species of a Genus Remarkable for the Activity of its Members .	188
SPOTTED RACERUNNER, <i>Cnemidophorus gularis</i>	188
TESSELATED LIZARD; WHIP-TAIL, <i>Cnemidophorus tessellatus</i>	188
Ivi. TWO-FOOTED WORM LIZARD, <i>Bipes caniculatus</i> Worm-like and Practically Blind. A Degenerate Burrowing Lizard	189
FLORIDA WORM LIZARD, <i>Rhineura floridana</i>	189
Ivii. FIVE-LINED SKINK; "SCORPIAN," <i>Eumeces quinelineatus</i>	194
SKILTON'S SKINK, <i>Eumeces skiltonianus</i>	194
Iviii. FLORIDA SKINK, <i>Eumeces egregius</i>	195
GROUND LIZARD, <i>Lygosoma laterale</i>	195

PART IV: THE SNAKES

Order OPHIDIA

lix. EGGS OF NORTH AMERICAN SERPENTS	206
lx. BREEDING HABITS OF SNAKES	207
lxi. BREEDING HABITS OF SNAKES. FRESHLY HATCHED EXAMPLES OF OVIPAROUS SERPENTS	208
lxii. BREEDING HABITS OF SNAKES	209
lxiii. BLIND SNAKES	210
lxiv. HEAD OF THREE-LINED BOA, <i>Lichanura trivirgata</i> .	211
HEAD AND UNDER PART OF TAIL OF THE RUBBER BOA, <i>Charina bottæ</i>	211
RUBBER BOA, <i>Charina bottæ</i>	211
lxv. BREEDING HABITS OF SNAKES	222
lxvi. STUDIES OF HEADS. Genus <i>Eutænia</i>	223
lxvii. RIBBON SNAKE, <i>Eutænia saurita</i>	224
SOUTHERN RIBBON SNAKE, <i>Eutænia sackeni</i>	224
WESTERN RIBBON SNAKE, <i>Eutænia proxima</i>	224
lxviii. PLAINS GARTER SNAKE, <i>Eutænia radix</i>	225
BUTLER'S GARTER SNAKE, <i>Eutænia butleri</i>	225

List of Half-tone Illustrations

PLATE		FACING PAGE
Ixix.	WESTERN GARTER SNAKE, <i>Eutænia elegans</i>	228
	ONE-STRIPED GARTER SNAKE, <i>Eutænia elegans</i> ; phase <i>infernalis</i>	228
Ixx.	GRAY GARTER SNAKE, <i>Eutænia elegans vagrans</i>	229
	MARCY'S GARTER SNAKE, <i>Eutænia elegans marci</i>	229
Ixxi.	BROWN GARTER SNAKE, <i>Eutænia equestris</i>	236
	Phases of the COMMON GARTER SNAKE, <i>Eutænia sirtalis</i>	236
Ixxii.	RED-BARRED GARTER SNAKE, <i>Eutænia sirtalis parietalis</i>	237
	PICKERING'S GARTER SNAKE, <i>Eutænia sirtalis pickeringii</i> . This is the blackest of the varieties of <i>E. sirtalis</i>	237
	SPOTTED GARTER SNAKE, <i>Eutænia sirtalis ordinata</i>	237
Ixxiii.	HEADS OF THE WATER SNAKES. <i>Tropidonotus leberis</i> , Ohio. <i>Tropidonotus fasciatus</i> , Florida; <i>Tropi- donotus grabami</i> , Missouri; <i>Tropidonotus tax- ispilotus</i> , Georgia; <i>Tropidonotus rhombifer</i> , Illinois; <i>Tropidonotus validus</i> , Mexico: <i>Semi- natrix pygæa</i> , Florida	240
Ixxiv.	QUEEN SNAKE, <i>Tropidonotus leberis</i> . (Young)	241
	QUEEN SNAKE, <i>Tropidonotus leberis</i> . (Adult)	241
	GRAHAM'S WATER SNAKE, <i>Tropidonotus grabami</i>	241
Ixxv.	BANDED WATER SNAKE, <i>Tropidonotus fasciatus</i>	244
	RED-BELLIED WATER SNAKE, <i>Tropidonotus fasciatus erythrogaster</i>	244
Ixxvi.	COMMON WATER SNAKE, <i>Tropidonotus fasciatus sipedon</i>	245
	BLOTCHED WATER SNAKE, <i>Tropidonotus fasciatus transversus</i>	245
Ixxvii.	FLAT-TAILED WATER SNAKE, <i>Tropidonotus compressi- caudus</i>	252
	DIAMOND-BACK WATER SNAKE, <i>Tropidonotus rhomb- ifer</i>	252
Ixxviii.	GREEN WATER SNAKE, <i>Tropidonotus cyclopium</i>	253
	BROWN WATER SNAKE, <i>Tropidonotus taxispilotus</i> . Largest of the North American Water Snakes, Reaching a Length of Five Feet	253

List of Half-tone Illustrations

PLATE		FACING PAGE
lxxix.	THE HOME OF THE BLACKSNAKE	256
	WHERE THE WATER SNAKES BASK	256
lxxx.	KIRTLAND'S WATER SNAKE, <i>Clonophis kirtlandi</i>	257
	STRIPED SWAMP SNAKE, <i>Tropidoclonium lineatum</i>	257
lxxxix.	BLACK SWAMP SNAKE, <i>Seminatrix pygæa</i>	260
	ALLEN'S SNAKE, <i>Liodytes alleni</i>	260
lxxxii.	HEADS OF MISCELLANEOUS SMALL SERPENTS	261
lxxxiii.	DEKAY'S SNAKE, <i>Storeria dekayi</i>	268
	STORER'S SNAKE; RED-BELLIED SNAKE. <i>Storeria</i> <i>occipitomaculata</i>	268
lxxxiv.	BROWN SNAKE, <i>Haldea striatula</i>	269
	VALERIA'S SNAKE, <i>Virginia valeriae</i>	269
lxxxv.	HEADS OF NORTH AMERICAN RACERS	274
lxxxvi.	HEADS OF NORTH AMERICAN RACERS	275
lxxxvii.	INDIGO SNAKE, <i>Spilotes corais couperi</i> . The Largest Serpent of the Eastern United States, Attaining a Length of 9 Feet	286
	CRIBO, <i>Spilotes corais melanurus</i>	286
lxxxviii.	YOUNG OF THE COMMON RACER, <i>Zamenis con-</i> <i>strictor</i>	287
	BLACKSNAKE; RACER, <i>Zamenis constrictor</i> . Adult —Northern Phase	287
lxxxix.	BLACKSNAKE; RACER, <i>Zamenis constrictor</i> —South- ern Phase	290
	BLUE RACER, <i>Zamenis constrictor flaviventris</i>	290
xc.	COACHWHIP SNAKE, <i>Zamenis flagelliformis</i>	291
	STRIPED RACER; WHIP-SNAKE, <i>Zamenis tæniatus</i>	291
xc.	FLAT-NOSED SNAKE, <i>Salvidora grabamiae</i>	294
	FOX SNAKE, <i>Coluber vulpinus</i>	294
xcii.	HEADS OF NORTH AMERICAN COLUBERS	295
xciii.	PILOT BLACKSNAKE, <i>Coluber obsoletus</i>	298
	BLOTCHED CHICKEN SNAKE, <i>Coluber obsoletus</i> <i>confinis</i>	298
xciv.	YELLOW CHICKEN SNAKE; FOUR-BANDED COL- UBER, <i>Coluber obsoletus quadrivittatus</i> —Adult	299
	EGGS OF FOUR-BANDED COLUBER, <i>Coluber obso-</i> <i>letus quadrivittatus</i>	299
	YOUNG OF THE FOUR-BANDED COLUBER	299

List of Half-tone Illustrations

PLATE	FACING PAGE
xcv. EMORY'S COLUBER, <i>Coluber emoryi</i> . A Powerful Example of the Useful, Rat-eating Snakes— Genus <i>Coluber</i>	300
xcvi. CORN SNAKE, <i>Coluber guttatus</i>	301
SMOOTH-SCALED COLUBER, <i>Rhinecbis elegans</i>	301
xcvii. HEADS OF SMOOTH-SCALED COLUBER, <i>Rhinecbis elegans</i> , Arizona	304
PINE SNAKE, <i>Pituophis melanoleucus</i> , New Jersey Phase.	304
PINE SNAKE, <i>Pituophis melanoleucus</i> . Florida Phase.	304
BULL SNAKE, <i>Pituophis catenifer</i> . California.	304
xcviii. COMMON PINE SNAKE, <i>Pituophis melanoleucus</i>	305
PINE SNAKE, <i>Pituophis melanoleucus</i> —Southern Phase	305
xcix. COMMON BULL SNAKE, <i>Pituophis sayi</i> . Largest of the North American Serpents.	320
PACIFIC BULL SNAKE, <i>Pituophis catenifer</i>	320
c. KEELED GREEN SNAKE, <i>Cyclophis æstivus</i>	321
SMOOTH-SCALED GREEN SNAKE, <i>Liopeltis vernalis</i>	321
ci. ROCK SNAKE, <i>Hypsiglena ocellorhyncha</i>	322
PACIFIC BROWN SNAKE, <i>Contia mitis</i>	322
cii. EASTERN RING-NECKED SNAKE, <i>Diadophis punctatus</i>	323
WESTERN RING-NECKED SNAKE, <i>Diadophis amabilis</i>	323
ciii. HEADS OF MILK SNAKE, <i>Ophibolus doliatus triangulus</i> , New York	334
RED MILK SNAKE, <i>O. d. clericus</i> , Virginia	334
BROWN KING SNAKE, <i>O. rhombomaculatus</i> , Virginia	334
COMMON KING SNAKE, <i>O. getulus</i> , Florida	334
BOYLE'S KING SNAKE, <i>O. getulus boylii</i> , Cali- fornia.	334
ARIZONA KING SNAKE, <i>O. zonatus</i> , Arizona	334
civ. BROWN KING SNAKE, <i>Ophibolus rhombomaculatus</i> . (Young Adult)	335
BROWN KING SNAKE, <i>Ophibolus rhombomaculatus</i>	335

List of Half-tone Illustrations

PLATE	FACING PAGE
cvi. RINGED SNAKE, <i>Ophibolus doliatus gentilis</i> . From Nebraska	340
MEXICAN RINGED SNAKE, <i>Ophibolus micropholis</i> (Old Example). Adult Examples are a Rich, Golden-brown, with Obscure, Darker Brown Blotches. The Food Consists Mostly of Small Birds and Rodents	340
cvii. ARIZONA KING SNAKE; RINGED SNAKE, <i>Ophibolus zonatus</i> . From Arizona	341
ARIZONA RINGED SNAKE; KING SNAKE, <i>Ophibolus zonatus</i> . From California	341
SAY'S KING SNAKE, <i>Ophibolus getulus sayi</i>	341
cviii. COMMON KING SNAKE; CHAIN SNAKE, <i>Ophibolus getulus</i> . A notoriously cannibalistic reptile	348
BOYLE'S KING SNAKE, <i>Ophibolus getulus boylii</i>	348
cix. HEADS OF MISCELLANEOUS HARMLESS SERPENTS	349
cx. RAINBOW SNAKE, <i>Abastor erythrogrammus</i>	368
RED-BELLIED SNAKE, <i>Farancia abacura</i>	368
cx. WORM SNAKE, <i>Carpophis amœnus</i>	369
SCARLET SNAKE, <i>Cemophora coccinea</i>	369
LECONTE'S SNAKE, <i>Rhinobolus lecontei</i>	369
cxii. HEADS OF THE HOG-NOSED SNAKES	376
cxiii. COMMON HOG-NOSED SNAKE, <i>Heterodon platyrhinus</i>	377
BLACK HOG-NOSED SNAKE, <i>Heterodon platyrhinus niger</i>	377
cxiv. SOUTHERN HOG-NOSED SNAKE, <i>Heterodon simus</i>	384
cxv. WESTERN HOG-NOSED SNAKE, <i>Heterodon nasicus</i>	385
cxvi. CROWNED SNAKE, <i>Tantilla coronata</i>	400
MITER SNAKE, <i>Tantilla gracilis</i>	400
cxvii. ANNULATED SNAKE, <i>Sibon septentrionale</i>	401
HEAD OF HARLEQUIN SNAKE, <i>Elaps fulvius</i>	401
HEAD OF SONORA CORAL SNAKE, <i>E. euryxanthus</i>	401
cxix. HEADS OF SERPENTS	416
cxx. HEAD OF RATTLESNAKE	417
SKULL OF A PIT VIPER, SHOWING DEVELOPING FANGS	417
cxxi. COPPERHEAD SNAKE, <i>Ancistrodon contortrix</i> —(Common Phase)	418
COPPERHEAD SNAKE, <i>Ancistrodon contortrix</i> —(Texas Phase)	418

List of Half-tone Illustrations

PLATE	FACING PAGE
cxxii. HEADS OF COPPERHEAD SNAKE AND WATER MOCCASIN. From Top and Side	419
WATER MOCCASIN; "COTTON-MOUTH" SNAKE, <i>Ancistrodon piscivorus</i>	419
cxxiii. A COPPERHEAD "DEN"	422
HOME OF THE WATER MOCCASIN. A Bayou in the Georgia Lowgrounds	422
cxxiv. PLATES UNDER TAILS OF POISONOUS AND HARMLESS SNAKES	423
DIFFERENT STAGES OF THE RATTLE	423
LONGITUDINAL SECTION OF THE RATTLE	423
cxxv. HEADS OF DWARF RATTLESNAKES	426
cxxvi. PIGMY RATTLESNAKE, <i>Sistrurus miliarius</i>	427
MASSASAUGA, <i>Sistrurus catenatus</i>	427
cxxvii. A RATTLESNAKE "DEN"	430
A HAUNT OF THE DIAMOND RATTLESNAKE	430
cxxviii. TIMBER RATTLESNAKE AND NEWLY BORN LITTER	431
cxxix. HEADS OF NORTH AMERICAN RATTLESNAKES	438
cxxx. HEADS OF NORTH AMERICAN RATTLESNAKES	439
cxxxi. TIMBER RATTLESNAKE, <i>Crotalus horridus</i> . Yellow Phase	442
TIMBER RATTLESNAKE, <i>Crotalus horridus</i> . Black Phase	442
cxxxii. WESTERN DIAMOND RATTLESNAKE, <i>Crotalus atrox</i>	443
RED DIAMOND RATTLESNAKE, <i>Crotalus atrox ruber</i>	443
cxxxiii. MOUNTAIN DIAMOND RATTLESNAKE, <i>Crotalus atrox</i> —Phase <i>scutulatus</i>	452
BLACK-TAILED RATTLESNAKE, <i>Crotalus molossus</i>	452
cxxxiv. PRAIRIE RATTLESNAKE, <i>Crotalus confluentus</i>	453
PACIFIC RATTLESNAKE, <i>Crotalus oregonus</i>	453
cxxxv. HORNED RATTLESNAKE, <i>Crotalus cerastes</i>	460
HEAD OF THE HORNED RATTLESNAKE	460
cxxxvi. GREEN RATTLESNAKE, <i>Crotalus lepidus</i>	461
PRICE'S RATTLESNAKE, <i>Crotalus pricei</i>	461

PART I.
THE TURTLES AND TORTOISES
Order CHELONIA

CHAPTER I: CLASSIFICATION OF THE NORTH AMERICAN TORTOISES AND TURTLES

THE North American Chelonia is composed of *Tortoises*, *Turtles* and *Terrapins*. The two latter names are employed rather indiscriminately in different portions of this country, but the appellation—*Terrapin*, is generally applied to the hard-shelled, fresh-water species that are edible and consequently have a market value. The *Tortoises* are strictly terrestrial Chelonians.

Following is a classified arrangement of the families and genera:

Order CHELONIA

SUBORDER	FAMILY	GENUS	NORTH AMERICAN SPECIES
Athecae	{ SPHARGIDAE (Leather Turtles)	{ <i>Sphargis</i>	1 Species Marine
	{ CHELYDRIDÆ (Snapping Turtles)	{ <i>Chelydra</i> 1	" Fresh-water
		{ <i>Macrochelys</i> 1	" "
Thecophora	{ CINOSTERNIDÆ (Musk or Mud Turtles)	{ <i>Cinosternum</i> 6	" "
		{ <i>Aromochelys</i> 3	" "
	{ TESTUDINIDÆ (Fresh-water Turtles; the Tortoises)	{ <i>Chrysemys</i> 15	" "
		{ <i>Malacoclemmys</i> .. 6	" Fresh; brack
		{ <i>Chelopus</i> 4	" ish water
		{ <i>Emys</i> 1	" Fresh-water
		{ <i>Cistudo</i> 5	" Terrestrial
		{ <i>Testudo</i> 3	" "
	{ CHELONIDÆ (Sea Turtles)	{ <i>Chelonia</i> 2	" Marine
		{ <i>Thalassochelys</i> ... 2	" "
	{ TRIONYCHIDÆ (Soft-shelled Turtles)	{	
		{ <i>Trionyx</i> 4	" Fresh-water

Total number of Species: 44.

CHAPTER II: THE SEA TURTLES

Largest of the Chelonians. These Strictly Aquatic Reptiles may be Recognised by their Seal-like Flippers

All of the tropical and semi-tropical seas of the globe are inhabited by huge turtles, but with this great distribution, we find a peculiar condition relating to the number of species. Over these vast stretches of ocean, stupenduously rich in their variety of life—invertebrates, fishes, a large number of marine *serpents*, innumerable birds and many mammals—the chelonians are limited to five species; with the exception of one, each species occurs in the warmer waters of both the Old and the New World; thus a list of the North American reptiles must include those marine turtles that are found in the vicinity of our coasts.

While normally inhabiting the waters of the warmer latitudes, the sea turtles are often enticed northward, along our eastern coast, by the mild currents of the Gulf Stream; during the mid-summer months they enter the northern harbours and live comfortably enough, but during the approach of cold weather these wanderers become chilled and stupefied, and fall an easy prey to fishermen. Benumbed during the fall hurricanes, they are battered and cast lifeless upon the beaches of Long Island, Connecticut and Massachusetts, and by the very storms that originated over their native seas. Most of the big Leather-back Turtles in our northern museums, have met a fate like this.

Classification.—The marine turtles are divided into two families. From a standpoint of relationship, these families are widely separated; the classified list of the families and genera of North American turtles and tortoises, in the preceding pages, will show the proper standing of these reptiles. The Leather-back Turtle, (*Sphargis*), seems to be the survivor of an extinct group, and must be placed in a family by itself, while the Loggerheads, the Green Turtle and the

The Sea Turtles

Hawk's-bill Turtle are examples of evolution from the modern, fresh-water chelonians; development along the line of adaptation to a strictly marine life has produced a highly specialised form, but the shielded carapace and plastron, and other parts of the structure, show close relationship with the *Tes-tudinidæ*. Thus the student will appreciate that the family *Sphargidæ*—one species, and the *Chelonidæ*—four species, are not alone widely separated in classification, but appeal to one another only in a form that is essential to the life the species lead. With this understood, it is not inappropriate to embrace all the sea turtles in a chapter by themselves. This arrangement popularises the subject and makes it possible to construct a general key.

KEY TO THE SEA TURTLES

General: Limbs long, flat and paddle-like—*Flippers*.

A. Carapace with seven, heavy keels, running length-wise; covered with a leathery integument in place of shields.

Uniform dark brown, or black.

LEATHER-BACK TURTLE; TRUNK TURTLE, *Sphargis coriacea*.

B. Carapace covered with smooth shields, which do not overlap.

**Front flippers with two claws.*

Head very large. Carapace uniform brown or black. Alveolar (crushing) surfaces of jaws without ridges—under horny sheaths.

LOGGERHEAD TURTLE, *Thalassochelys caretta*.

Head very large. Carapace dark brown or black. Alveolar (crushing) surfaces of jaws with ridges—under horny sheaths.

KEMP'S LOGGERHEAD TURTLE, *Thalassochelys kempii*.

***Front flippers with one claw.*

Head of moderate size. Carapace olive or brown, mottled with yellow.

GREEN TURTLE, *Chelonia mydas*.

C. Carapace covered with smooth, loosely-overlapping shields.

Upper mandible beak-like. Carapace brown or black, mottled with yellow.

HAWK'S-BILL TURTLE, *Chelonia imbricata*.

The Sea Turtles

The Family *Sphargidæ*.—Composed of a single genus and one species—the largest of the chelonians, which attains a weight of 1,000 pounds.

THE LEATHERBACK TURTLE; TRUNK TURTLE; HARP TURTLE; LUTH

Sphargis coriacea, (Linn.)

Told from the other sea turtles taken off our coasts, by the heavy, ridge-like processes, seven in number, running lengthwise on the carapace. Instead of the horny shields usually present on turtles, the carapace is covered with a leathery integument; on large individuals, this soft covering is fully an inch in thickness and saturated with oil, like whale blubber. The front flippers are enormous; like the rear pair and the head, they lack the coarse plates of the other marine turtles.

Colouration.—Dark brown, generally uniform, but sometimes spotted with yellow. Very large individuals are often blackish.

Dimensions.—The Leather-back Turtle is the largest of living chelonians. Following are the measurements of a fine example received at the American Museum of Natural History; it was harpooned, while floundering, in a benumbed condition, off the beach of New London, Connecticut:

Total length, snout to end of tail	6 feet
Length of Carapace	5 " 1 inch
Width of Carapace	3 " 1 "
Width of Front Flipper	1 " 2 "
Stretch of Front Flippers, tip to tip ...	9 "
Diameter of Head	10 "
Weight	715 pounds.

Distribution.—Generally distributed in tropical and semi-tropical seas, but nowhere common; an accidental wanderer to the temperate coasts.

Habits.—Approaching the beaches only to deposit its eggs, this sea giant does not seem to differ in its habits from the other marine turtles. It apparently subsists upon sea-weeds, crustaceans, molluscs, and fishes—if it is able to catch the latter. Agassiz explains that it breeds every year, in the spring, on the Tortugas, the Bahamas and along the Brazilian coast. In



TRUNK TURTLE, *Sphargis coriacea*

Largest of the marine turtles. It attains a weight of 1,000 pounds. The shell is covered with a leathery integument. Occurs sparingly in all tropical and semi-tropical seas.



LOGGERHEAD TURTLE, *Thalassechelys caretta*

Sometimes confused with the Green Turtle, but distinguished by the proportionately much larger head. Its flesh is of considerable less value than that of the other species. Found in all of the warmer seas.



GREEN TURTLE, *Chelonia mydas*

Esteemed as an article of diet and well known in the markets. Receives its name from the greenish hue of the fat. Large examples weigh 800 pounds. Inhabits all the warmer seas



HAWK'S-BILL TURTLE, *Chelonia imbricata*

From this species is obtained the valuable "tortoise shell." It is the smallest of the marine turtles. Found in the warm seas of both hemispheres. Easily recognised by the overlapping shields

swimming it is very graceful and the massive flippers are employed in seal-like fashion.

The Family *Cheloniidæ*: Composed of two genera, each containing two species. Detailed descriptions follow:

THE LOGGERHEAD TURTLE

Tbalassochelys caretta, (Linn.)

Carapace thick and heavy, covered with large, smooth shields, as is the plastron. Head very large, plated; flippers plated, the front pair usually with two nails.

The Loggerhead might possibly be confused with the Green Turtle, owing to the similarity of the shells, but the larger head of the former, the two nails on the front flipper and the almost uniform hue of the carapace, are strong characteristics.

Colouration.—Carapace dull, uniform brown; plastron dull yellow.

Dimensions.—The largest example examined by the writer had a carapace 3 feet, 2 inches long; the animal tipped the scales at 303 pounds. Records of larger specimens are not rare.

Distribution.—Tropical and semi-tropical seas of both hemispheres; an accidental wanderer along the Northern coasts.

Habits.—Many of these turtles lay their eggs along the Florida coast. The female scoops a hole in the sand, deposits the eggs therein and shovels the sand back over them; she then retires to the sea, paying no more attention to them. These are the only times—in May and early in June, along our shores—that the adult turtle leaves the water; the eggs are deposited above tide-line. Six to eight weeks cover the period of incubation, and as the young turtles hatch they at once seek the water. Their progress is seldom toward the open sea, for they have little power to battle with the surf. They seek shallow inlets and here find partial protection from their many enemies in the shape of the larger fish and the sea birds. While very young, their flippers are wing-like in motions; as the young reptile tires they are folded against the upper portion of the carapace, in much the same manner as a bird tucks back its wings. (See accompanying illustration). The number of eggs deposited is enormous; it varies from fifty to a thousand, according to the size and the age of the female.

The Sea Turtles

Commercially, the Loggerhead is of much less value than the Green Turtle, yet it is often seen in the markets. A steak from one of these creatures looks much like beef.

KEMP'S LOGGERHEAD TURTLE

Tbalassochelys kempii, (Garman)

Structurally, this turtle is explained to differ from the preceding by the presence of ridges on the alveolar (crushing) surfaces of the jaws (beneath the horny coverings), which development closely approaches that of the Hawk's-bill Turtle; the bony, alveolar processes do not overlap the inner nostrils.

Distribution.—Recorded from the Gulf of Mexico.

THE GREEN TURTLE

Chelonia mydas, (Linn.)

Very large examples weigh 500 pounds, but such are rare.

Head proportionately much smaller than that of the Loggerhead Turtle. Carapace with smooth shields—polished on old individuals. Head and limbs plated. Front flippers usually with a single claw.

Colouration.—Carapace pale olive, richly marbled with yellow; the markings are often in the shape of bands, radiating from the centres of the shields. Plastron yellow. Head plates dull brown or olive, vividly margined with white.

This attractive animal derives its name from the greenish colour of the fat; the markings somewhat resemble those of the Hawk's-bill Turtle, but that animal is unique in the shingle-like arrangement of the shields of the carapace.

Dimensions.—A very large individual will have a carapace four feet long and will weigh about 500 pounds. This is much in excess of the thousands of turtles sent to the markets; such range in weight from 50 to 70 pounds; occasional hundred-pound specimens are seen in the rows of helpless animals turned upon their backs.

Distribution.—Tropical and semi-tropical seas throughout the world; a frequent wanderer into the waters along our Northern coasts.

Habits.—The practice, in the markets, of turning these animals over on their backs, is a necessary one. As the turtle

The Sea Turtles

is adapted to a life in the water, the plastron is soft and unsupported; when placed upon it, the weight of the reptile so presses against the under shell that it is forced against the lungs and other internal organs; the turtle soon dies from an inability to breathe.

From a lot of turtles that had been shipped north and were lying upon their backs for fully a week, the writer selected a specimen weighing forty-five pounds and placed it in a large tank containing manufactured salt water—enough salt added to fresh water to give it a brackish taste. On the second day in the tank the turtle began feeding, greedily taking large pieces of raw fish; it also ate the commoner kinds of sea-weed. Under these conditions it lived for nearly two years and would have thrived longer had it not been attacked by a small crocodile. The tank was ten feet long and eight feet wide and the animal swam about freely and gracefully; its deliberate motions, slow turns, the occasional stroke of the flippers and slow, gliding progress, were movements strikingly suggestive of the leisurely flight of a hawk or a turkey buzzard. The reptile seldom crawled upon the bottom of the tank, but skimmed over the gravel by a few inches; occasionally it came to the top, when it would expel the air in its lungs with a sharp hiss; the intake of air was more leisurely.

Of the sea turtles, the flesh of this species is most esteemed. The shell is smooth, brightly marked and attractive, but of practically no commercial value.

THE HAWK'S-BILL TURTLE

Chelonia imbricata, (Linn.)

Distinguished from the other sea turtles by the loosely-overlapping (*imbricate*) shields of the carapace. The structure of the shields on the plastron is like that of the Green Turtle. Head, limbs and flippers covered with shields; head elongated, the upper mandible terminating in a pronounced hook or beak—hence the popular name. (See accompanying illustration.) Two claws on each front flipper.

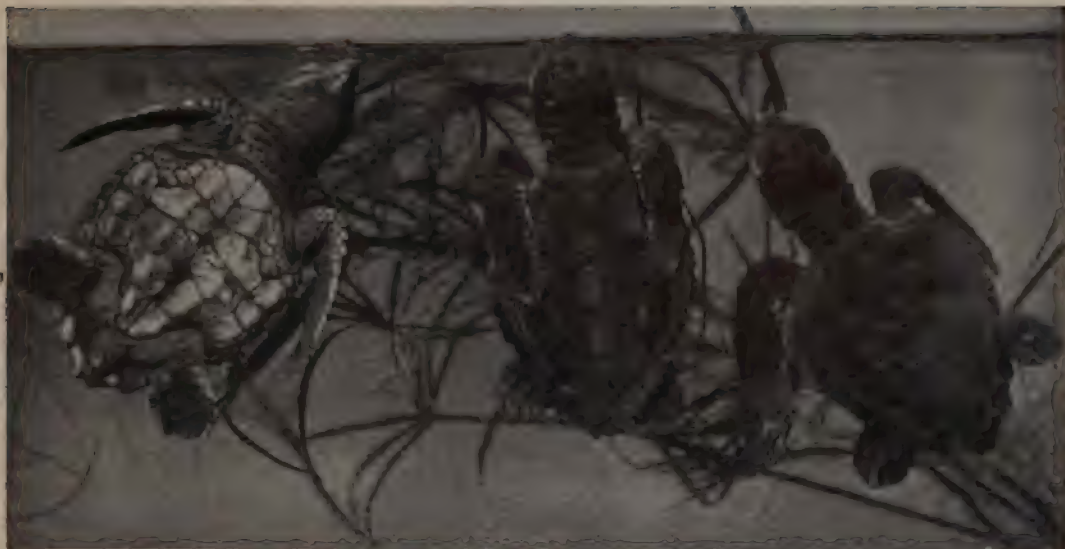
Colouration.—Carapace dark brown or black, richly marbled with yellow; plastron yellow. Shields of the head and limbs dark brown or black, margined with yellow.

The Sea Turtles

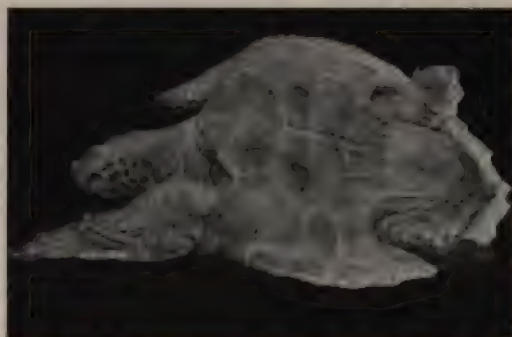
Dimensions.—Smallest of the sea turtles. The carapace of a very large animal will measure about two and a half feet in length; few examples of that length are captured nowadays.

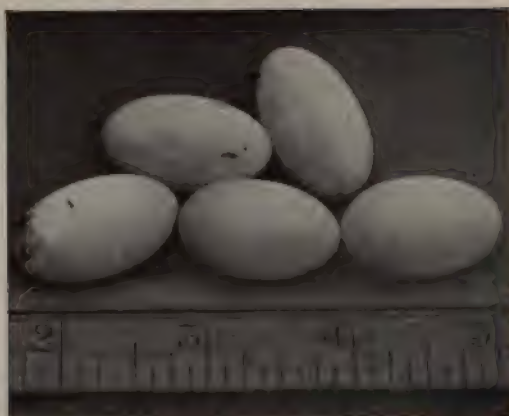
Habits.—Unlike its near ally, the Green Turtle, the present reptile is apparently carnivorous, living upon fish, crustaceans and molluscs. Like all of the marine chelonians, it lays its eggs on sandy beaches, above tide-line.

It is from this sea turtle only, that the valuable "tortoise-shell" of commerce is obtained; this is the clear, horny substance, in the shape of shields, covering the bony carapace.

YOUNG LOGGERHEAD TURTLES, *Thalassochelys caretta*

Very young sea turtles often seek shallow inlets to escape their many enemies. In such places they are sometimes very numerous

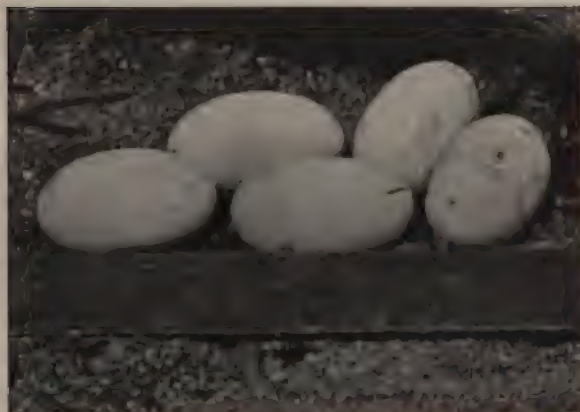
PLASTRON OF TRUNK TURTLE.
Sphargis coriaceaPLASTRON OF LOGGERHEAD TURTLE.
Thalassochelys carettaPLASTRON OF GREEN TURTLE.
Chelonia mydasPLASTRON OF HAWK'S-BILL TURTLE,
Chelonia imbricata



EGGS OF THE ARIZONA MUD TURTLE.
Cinosternum hirtiei



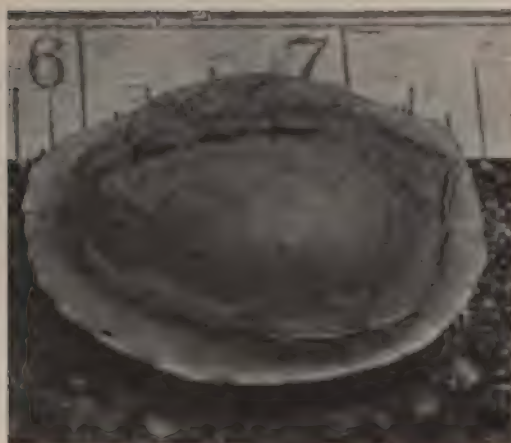
NEWLY HATCHED MUSK TURTLES.
Amblocheilus odoratus



EGGS OF THE SPOTTED TURTLE.
Chelydra gularis



A YEARLING MUSK TURTLE, *A. carolinus*
The back is very high



VERY YOUNG BOX TURTLE, *Cistuda carolina*
There is a very strong keel



A YOUNG GOPHER TORTOISE, *Testudo polyphemus*
The sharply delineated concentric grooves show a rapid growth

YOUNG TURTLES AND TORTOISES

CHAPTER III: THE SNAPPING TURTLES

FAMILY CHELYDRIDÆ

A Small Family, Composed of Three Large and Powerful Species

Classification.—Of the three species composing the family *Cbelydridæ*, two inhabit North America. The family is divided into two genera, *Cbelydra* and *Macrochelys*. One species of the former is widely distributed and abundant in the United States and ranges southward to Ecuador; the other species inhabits Mexico and Guatemala. The single species of *Macrochelys* is confined to the Southern United States.

General characters.—The Snapping Turtles are the largest of the fresh-water chelonians inhabiting the United States. Their general form is well known. The dull, rough carapace, with its heavy keels and marginal serrations, the proportionately huge and sinister head, and the long, fleshy tail, with its alligator-like crest combine to make these turtles unique. The plastron is insignificantly small and narrow and affords comparatively no protection—but these big turtles do not seek to withdraw the head and limbs like their smaller and weaker relations. They are bold and aggressive fighters and their massive, keen-edged jaws cause them to be the terror of most of the aquatic and semi-aquatic creatures.

The Common Snapping Turtle (*Cbelydra serpentina*), though larger than any other species of North American turtle, except its near ally, is dwarfed by the comparison of the latter species—the Alligator Snapping Turtle (*Macrochelys lacertina*). Adult specimens of this enormous, fresh-water turtle attain a weight of 130 and 140 pounds.

The genera may be defined, thus:

Under surface of tail with large shields. . . . *Cbelydra*.

Under surface of tail with large scales. . . *Macrochelys*.

Besides these characters the following points may be employed in separating the two species inhabiting the United States:

The Snapping Turtles

- a. Three moderate keels on the carapace.
Colour.—Very dark olive, or dark brown.
COMMON SNAPPING TURTLE, *Chelydra serpentina*.
Distribution.—North America east of the Rockies;
southward to Ecuador.
- b. Three very high keels on the carapace.
Colour.—Pale brown or yellowish.
ALLIGATOR SNAPPING TURTLE, *Macrochelys lacertina*.
Distribution.—Rivers emptying in the Gulf of
Mexico—Florida to Texas; northward to Missouri.

The Snapping Turtles are herewith considered in detail:

THE COMMON SNAPPING TURTLE

Chelydra serpentina, (Linn.)

Large specimens will weigh about forty pounds and such would have a carapace about fourteen inches long.

The carapace is very sharply serrated in the rear. There are three blunt, broken keels, rising as tubercles at the rear margins of the shields through which they pass. The carapace of old individuals is quite smooth. With young specimens there are radiating lines or ridges from the higher portions of the keels. Very young specimens are exceedingly rough. See Fig.—The plastron is small and narrow, exposing a great amount of the fleshy parts.

The under-surface of the tail is covered with large shields.

As with all of the very aquatic chelonians the feet are broad and extensively webbed. Both front and rear pairs are provided with large and coarse nails.

Most characteristic about this, and the allied species, is the huge, powerful head; the upper and lower mandibles terminate in strong hooks. Though the eyes are comparatively small, they are very keen of vision. The head cannot be completely withdrawn into the shell, nor can the tail—nearly as long as the upper shell—be protected beyond folding against the lower margin of the shell.

Colouration.—Carapace, dull olive or dark brown, with little or no markings; plastron dull yellow. The upper portion of the head is very dark as is the upper-surface of the limbs and tail; beneath, these members are yellowish.



COMMON SNAPPING TURTLE, *Chelydra serpentina*

Large example—weight about 40 pounds. A common species, capable of inflicting severe wounds. Found from eastern Canada to Florida.



YOUNG SNAPPING TURTLES, *Chelydra serpentina*

Two young examples are shown in habit of swimming with feet.



ALLIGATOR SNAPPING TURTLE, *Macrochelys lacertina*

Distinguished from the common snapping turtle by the absence of broad plates under the tail, the yellowish colour, and much larger size. Reaches a weight of 140 pounds. Inhabits rivers emptying into the Gulf of Mexico



HEAD OF THE ALLIGATOR TURTLE, *Macrochelys lacertina*

The jaws of a large specimen could readily amputate a man's hand or foot

The Snapping Turtles

Dimensions.—The figures given represent a fair-sized adult:

Total length, with Tail and Head outstretched	28	inches.
Length of Carapace	12	"
Width of Carapace	10½	"
Length of Plastron	8½	"
Length of Tail	11	"
Circumference of Head	10	"
Weight	32	pounds.

Distribution.—Southern Canada and the United States generally east of the Rocky Mountains; southward through Mexico to Ecuador.

Habits of the Snapping Turtle

Sinister in appearance and equally vicious as its looks imply, the Snapping Turtle is one of the most familiar of the North American reptiles. It inhabits slow-running, muddy rivers and streams, ponds and marshes. Very old specimens are sometimes so bloated and overburdened with fat that the fleshy parts protrude beyond the margin of the shell and so hinder the progress of the limbs that the reptile is almost helpless when removed from the water. Specimens in this condition are said to be excellent as food. Large numbers of snapping turtles are sold in the markets of Philadelphia and Baltimore. They fetch about ten cents per pound.

With the exception of the soft-shelled turtles—genus *Trionyx*, the Snapping Turtles are rather unique among chelonians, in defending themselves in a like fashion to snakes; namely by “striking” at the object of anger. The rapidity with which the head is lurched forward rivals the dexterity of the rattlesnake. So quick is the movement that the eye is barely able to follow it. Backed up by a pair of keen-edged, cutting mandibles and jaw muscles of tremendous power, the stroke of these dangerous brutes may be followed by anything but superficial injury. The amputation of a finger by a medium-sized specimen, or a hand by a very large individual would be an accomplishment of no difficulty to the reptile. As in their native state these turtles lie partially embedded in the mud of the river-bottom, the rapid movements of the head and neck are important in the capture of fish which form the larger portion of the food. But the Snapping Turtle is an exceedingly voracious brute,

The Snapping Turtles

and is not particular as to its fare. Young water fowl are stalked from beneath the surface, seized by a dart of the jaws and pulled below to drown and be quickly torn to pieces by the keen mandibles assisted by the front limbs. The turtle is entirely carnivorous. It never feeds unless under water, but it will sometimes seize its prey on the bank of a stream, then retreat into the necessary element. To keep one of these reptiles in water so shallow that it is unable to entirely immerse its head and supply it regularly with the most tempting food, would ultimately result in its starvation. It appears that the reptile is unable to swallow unless the head is under water.

As a captive the Snapping Turtle feeds readily and lives for many years. It will take food from the hand that feeds it, but most specimens resent undue familiarity and snap viciously when handled. The safest way to handle a large specimen is to pick it up by the tail and hold it well off from one's body. As the animal is able to throw the head well back over the shell and to strike a considerable distance sideways, it is altogether dangerous to hold a large specimen by the shell. Small individuals may be safely handled by grasping them by the rear portion of the shell, which position removes the fingers from the play of the jaws.

In the early summer, the female leaves the pond or stream so persistently haunted at all other times and prowls about for a place to deposit her eggs. She often wanders many feet from the water and, selecting a damp spot, scoops away the earth to form a hollow into which she crawls and moves about until the loose soil falls back over her. Thus she is hidden until the eggs are deposited and to the number of about two dozen. As she crawls forth the shell is reared to a sharp degree and the earth that has fallen upon it is left covering the eggs. They are perfectly round, white and with a thin, hard shell.

As the Snapping Turtle is persistently aquatic the shells of many specimens become coated with moss. As they lie partially buried in the mud, in shallow water, they look much like flat stones. In such places they remain for hours, poking the extreme tip of the snout from the water to breathe. They are able to remain for long periods entirely submerged and will dive to the deepest portions of rivers where they prowl along the bottom in search of food.

THE ALLIGATOR SNAPPING TURTLE

Macrochelys lacertina, (Schweigger)

Attains a maximum weight of about 140 pounds and a length of shell of about 28 inches.

General structural characters much like the preceding species, but differing as follows:

1. There are no large shields under the tail, but in their place, *small, rounded scales*.
2. *The presence of additional marginal shields (supramarginals)*.
3. The much higher keels on the carapace.

Colouration.—Carapace, head and limbs, pale brown, or yellowish. The plastron is of a similar, though paler hue.

Dimensions.—The measurements relate to a specimen captured in the Mississippi River:

Length of Carapace	25 inches.
Width of "	20 "
Length of Plastron	16½ "
Circumference of Head	24½ "
Length of Tail	21½ "
Weight	115 pounds.

Distribution.—Rivers emptying into the Gulf of Mexico, from western Texas to western Florida. The species ranges northward to Missouri. Common in the Mississippi River.

Habits.—This giant among fresh-water reptiles, is but a magnified duplication of the common snapping turtle, both in looks and actions. Its pale brown hues well match the muddy waters it inhabits. With its colours in perfect harmony, it lies motionless on the soft bottom, ready to seize, with a lightning-like dart the unsuspecting fish that comes its way. While thus resting it is able to entice its prey by a remarkable appendage attached to the inside of the lower jaw, close to the region of the tongue. This is a well-developed filament of flesh, white and distinct from the yellowish mouth-parts and resembling a large grub to such a degree of nicety that the popular-minded observer, seeing the object in the reptile's mouth would declare it to be the larva of some insect. More striking, however, is the reptile's power to keep this appendage in motion, giving it the aspect of crawling about in a small, circular course.

The Snapping Turtles

With the mud-coloured shell lying close to the bottom, the jaws thrown open to a great extent, this organ is put in motion. Every other portion of the creature is as motionless as a rock. In this position of rigidity the shell looks like a great, round stone and blotches of fine, waving moss intensify the deception; the big head looks like another stone, beneath which there is a cavern and in this cavern crawls the white grub, to all appearances an object dear to the hearts of finny wanderers. But woe to the luckless fish that swims within reach of those yawning jaws!

The strength of the Alligator Turtle is enormous. The specimen from which the measurements were taken upon being teased with the end of a broomstick, actually severed three inches from the end of this substantial material. A fair-sized shad was given the turtle every three days. Slowly crawling toward the food it would snap off a large section and swallow it with a gulp. The piece taken out of the fish was as sharply defined and quickly removed as if cut with a die. The entire fish was thus consumed, in clean-cut sections.

Captive specimens are shy and feed sparingly unless provided with means to hide. The specimen described was content to hide under a raft of small logs, tied to one corner of the tank and under which it lay for the great part of its time, occasionally protruding the tip of the nose from the water. Among other turtles (*Chrysemys*) and a number of half-grown alligators it was perfectly friendly, a disposition which the writer can credit to other captive specimens of this turtle and the common snapping turtle as well.

CHAPTER IV: THE MUSK OR MUD TURTLES

FAMILY CINOSTERNIDÆ

The Genera AROMOCHELYS and CINOSTERNUM, Composed of Small and Thoroughly Aquatic Species, the Majority Inhabiting North America

ALL of the species of the small family *Cinosternidæ*, bear a general resemblance to one another. They are of small size—few attaining a length of five inches. The upper shell is bluntly oval in outline, rounded above, and possesses no trace of the flaring edge, or scolloped border as does the shell of typical pond and river turtles. It might be said that the carapace of these turtles looks like a smooth, flat stone. The under shell—plastron—is a distinguishing character. It is composed of a broad, rigid bridge, and two hinged, movable lobes, that may be drawn up against the carapace—slightly so with *Aromochelys*, but to such an extent with *Cinosternum*, that the species of the latter genus have sometimes been called “box turtles,” an appellation which rightly belongs, however, to a genus of strictly terrestrial turtles (*Cistudo*).*

Classification and Distribution.—But two genera constitute this family. *Aromochelys* appears to be represented by three species, all of which occur in eastern North America. The larger genus, *Cinosternum*, comprises about eleven species, six of which inhabit the United States and northern Mexico; one occurs in Mexico generally except the northern portion, three in Central America, and one in northern Brazil and the Guianas. The structural differences of these species are but slight, and in technical nomenclature described principally from the shape of the shields forming the plastron. The greater number of the species of both genera display much the same colouration of the upper and lower shells. Some slight characters are exhibited

* With *Cistudo*, there is no rigid bridge. The plastron is attached to the upper shell by a cartilaginous joint. It is divided by a central hinge—front and rear portions closing tightly against the carapace.

The Musk or Mud Turtles

in the markings of the head. Generally speaking, it must be explained that many of the species are very difficult to determine. As a large series of specimens demonstrate that the characters of the plastron are subject to considerable variations, it is possible that the present number of species will be condensed, after further investigations.

The student is advised to carefully examine the plastrons (lower shells) of the species figured and to become familiar with the distribution of these turtles. By working in this fashion the determination of specimens is rendered systematic and the detailed descriptions will impart their references in a thoroughly comprehensive manner.

All of the *Cinosternida* are thoroughly aquatic, frequenting slow-running streams or muddy rivers, from which they seldom venture. In such places they are admirably protected by their dull, mud-coloured shells, which are often coated with moss. These turtles exude a strong and musky odor when annoyed. They are much disliked by persons who fish in fresh-water, as they will greedily take a hook and perform such antics in the water that the sportsman is often lead to anticipate that he has captured a fish of prodigious size. When handled, they snap and bite fiercely, and, in fact, represent in miniature the actions of the formidable snapping turtle.

TABULATED LIST OF THE NORTH AMERICAN MUD TURTLES

- I. Plastron very narrow; not protecting the fleshy parts.
Genus *Aromochelys*.

- a. Yellow stripes on head; carapace of adult not keeled.

Two yellow stripes on side of head, from snout, above and beneath the eye to the neck.

COMMON MUSK TURTLE, *A. odoratus*.

Distribution.—Canada to Florida; westward to Texas.

Two yellow stripes on side of head; one from snout above eye to the neck; the other from above angle of jaw to the neck.

SOUTHERN MUSK TURTLE, *A. tristycha*.

Distribution.—Georgia and Florida to Texas.

- b. Head spotted; carapace of the adult strongly keeled. Head olive or gray, with round, black spots.

KEELED MUSK TURTLE, *A. carinatus*.

Distribution.—Georgia to Arizona.

The Musk or Mud Turtles

II. Plastron protecting the limbs and fleshy parts when lobes are closed. Genus *Cinosternum*.

- a. Plastron moderately wide—not entirely closing the shell.

1. Head with stripes or bands.

*Three yellow bands on carapace**; narrow stripes on each side of head.

BANDED MUD TURTLE, *C. bauri*.

Distribution.—Southeastern United States.

Carapace olive or brown; two broad, orange bands on each side of head.

LOUISIANA MUD TURTLE, *C. louisianæ*.

Distribution.—Louisiana and Texas.

2. Top of head uniform—sides bright yellow.

Carapace olive or brown; sides of head and neck bright yellow.

YELLOW-NECKED MUD TURTLE, *C. flavescens*.

Distribution.—Arkansas to Arizona.

3. Head spotted.

Carapace olive or brown; head olive, speckled with black.

COMMON MUD TURTLE, *C. pennsylvanicum*.

Distribution.—Eastern and Western states.

III. Plastron very wide, completely encasing limbs when lobes are closed.

Genus *Cinosternum*—continued

Carapace brownish-yellow; head olive, with obscure markings.

ARIZONA MUD TURTLE, *C. henrici*.

Distribution.—New Mexico; Arizona.

Carapace brownish-yellow; head gray, spotted with black.

MEXICAN MUD TURTLE, *C. integrum*.

Distribution.—Mexico generally, well into the northern portion.

The Genus Aromochelys.—Although some authorities have united this genus with *Cinosternum*, the writer believes that the very narrow plastron, so characteristic with the three species, constitutes an important point for the foundation of an independent genus. With this narrow under shell and the consequent exposure of the fleshy parts, together with the proportionately large head, these little turtles resemble in miniature, the large, vicious species of the *Chelydridæ*—the snapping turtles. Three species of this genus are recognised. Their descriptions follow:

* The only species with longitudinal bands on the shell.

The Musk or Mud Turtles

THE COMMON MUSK TURTLE

Aromochelys odoratus, (Latr.)

The upper shell is rather narrowly oval and arched to a considerable degree. With young specimens it is strongly keeled, but the keel disappears with the adult, or becomes very blunt and obscure. The plastron is very narrow and much shorter than the upper shell. Neither of the lobes are capable of being drawn upward to any extent. With young specimens they are rigid, and the rear portion remains immovable until the reptile is well grown.

The head is proportionately large, with tapering, conical snout. The feet are broadly webbed.

Colouration.—With young specimens the carapace is dull olive or brown, the shields showing narrow, black margins. Old specimens are of a dull, lusterless brown and usually coated with moss. The plastron is dark yellow or brown.

The head markings are important. On each side of the head are two bright yellow stripes, both extending from the tip of the snout to the neck. One of these stripes passes over the eye; the other extends backward beneath the eye, running parallel with the line of the jaw, thence bending slightly downward behind the angle of the mouth and running to the neck.

<i>Dimensions.</i> —Length of Carapace	.....	3 $\frac{1}{2}$	inches.
Width of	.....	2 $\frac{1}{2}$	"
Length of Plastron	.....	2 $\frac{1}{4}$	"
Width of Front Lobe at Hinge.	...	1 $\frac{5}{8}$	"
" of Rear	" " "	1 $\frac{3}{8}$	"
Width of Bridge of Plastron	.....	2	"
Length of " " "	.....	$\frac{3}{4}$	"
Width of Head	.....	$\frac{7}{8}$	"

Distribution.—Southern Canada to the Gulf of Mexico; westward to Illinois in the North, and to Texas in the southern portion of the range. The species is generally abundant.

Habits.—Frequenting slow-running streams and muddy rivers, this pugnacious little reptile is in habits, as well as in looks, an understudy of the snapping turtle. When handled it emits a strong, though not highly disagreeable odour, which, contrary to many assertions, is not of so powerful a nature as to resist repeated washings in an effort to remove it. This

The Musk or Mud Turtles

odour is characteristic of all of the *Cinosternidæ*, though particularly pronounced with the species of *Aromochelys*.

Except for the purpose of coming to the shore to deposit its eggs, the Musk Turtle seldom leaves the water. It crawls about on the bottom of rivers and ponds, searching for food to satisfy its voracious and carnivorous appetite. Frequently it runs afoul of the fisherman's hook, baited with small fish or worm. Pulled to the surface it snaps viciously and emits the characteristic odour which gives the species its name.

As a captive the Musk Turtle is rather timid and, like the snapping turtle, will take advantage of hiding places or dark corners of its tank. Its movements when crawling about the bottom of an aquarium or in swimming show deliberation and perfect ease and prove the creature's fitness for exploring the muddy beds of rivers. As an experiment the writer kept several specimens in a deep aquarium, without means of leaving the water, or obtaining a foothold at the top, to breathe. The test continued for several weeks. These turtles either crawled about the bottom of the tank or swam leisurely to the surface for a breath of air. They fed readily and from all indications would have lived indefinitely under such conditions. Pond turtles or river turtles—terrapin—if thus treated, would have soon become exhausted and ultimately succumbed by drowning.

During the first warm days of Spring, the Musk Turtles seek very shallow water, and lie basking in the sun. At such times they may be taken in large numbers.

THE SOUTHERN MUSK TURTLE

Aromochelys tristycha, (Agassiz)

At a glance this turtle at once appeals to the preceding species, but the head markings are different, the upper shell is more elongated, while the forward, central shield of the carapace is much narrower.

Colouration.—Upper and lower shell like the preceding species. There is a narrow stripe from the snout, extending over the eye, thence back upon the neck. Beneath this is a second stripe, extending from slightly above the angle of the jaw, backward upon the neck. The chin has spots in place of the two light bands of *A. odoratus*. With some specimens the

The Musk or Mud Turtles

head bands are very obscure. These are generally old individuals and the head is brown, streaked or speckled with black.

Dimensions.—The measurements of an adult specimen from Enterprise, Florida, are given:

Length of Carapace	4 inches.
Width of	2½ "
Length of Plastron	3 "
Width of Head	1½ "

From these measurements it will be seen that the head is proportionately larger than with *A. odoratus*.

Distribution.—The southeastern portion of the United States—Florida to Texas.

Habits.—Similar to the preceding species.

THE KEELED MUSK TURTLE

Aromochelys carinatus, (Gray)

The carapace is high and wedge-shaped, with a strong keel upon the rear portion, a character existing with young specimens of the two preceding species, but retained in the adult form of the present species. The head is proportionately larger than that of *A. odoratus* and the jaws are more strongly developed.

Colouration.—Unlike the allied species the head is dark brown or olive, profusely spotted with black. There are no traces of stripes.

The carapace is dull olive or brown, with black spots or streaks, or radiating bars. The plastron is yellow.

Dimensions.—The Keeled Musk Turtle attains a length of shell of five inches, but the proportions of a smaller specimen are given.

Length of Carapace	3½ inches.
Width of	2½ "
Length of Plastron	2½ "
Width of Front Lobe at Hinge	1½ "
" " Rear " " "	1⅞ "

Distribution.—The southern portion of the United States, from Georgia (inclusive) to Arizona (inclusive).

Habits.—The general habits appeal to the other species of the genus.



COMMON MUSK TURTLE, *Aromochelys odoratus*

Abundant in muddy rivers of eastern North America. Often takes the hooks of fishermen, and when handled gives out a strong, musky odour.



SOUTHERN MUSK TURTLE, *Aromochelys tristycha*

Closely allied to the preceding species



KEELED MUSK TURTLE, *Araucichelys carolinensis*
 Found in sluggish rivers from Georgia to Arizona. In the centre of the back is a high, sharp keel.



COMMON MUD TURTLE, *Cinosternum pennsylvanicum*
 A common turtle in eastern North America. Note the width of the plastron as compared with the species of *Araucichelys*.

The Musk or Mud Turtles

The Genus Cinosternum.—Six species of *Cinosternum* occur in the United States and northern Mexico; they may be at once recognised from *Aromochelys* by the much broader plastron, the lobes of which can be drawn upward against the lower edge of the carapace, covering the limbs and fleshy parts. While the species of *Aromochelys* are usually known as Musk Turtles, the reptiles of the present genus are more generally called Mud Turtles, though they exude much the same musky odours as the former. Their habits are quite similar to those of the Musk Turtles

THE COMMON MUD TURTLE

Cinosternum pennsylvanicum, (Bosc.)

The upper shell is broader and more flat than with the musk turtles.* The plastron is nearly as wide as the opening of the shell—the front and rear lobes loosely hinged and capable of being drawn upward to protect the head, limbs and fleshy parts.

Colouration.—Upper shell dull olive or brown, the shields with narrow black margins. The plastron is yellow or pale brown.

With the exception of the jaws, which are of a uniform olive, the head is *usually* brown, with numerous, greenish-yellow spots. On some specimens these spots run together, forming yellowish stripes on the sides of the head, a condition which causes the head to resemble that of the musk turtle, (*A. odoratus*), but the broad plastron at once distinguishes this species from the former.

Dimensions.—The Common Mud Turtle attains a maximum size of four inches. Following are the measurements of an average sized specimen:

Length of Carapace	3½ inches.
Width “	2½ “
Length of Plastron	3½ “
Width of Front Lobe at Hinge	1½ “
“ “ Rear “ “ “	1½ “
Length of Bridge	¾ “
Width of Head	¾ “

* On the carapace of young specimens are three faint keels. On occasional adult specimens there is a blunt, central keel.

The Musk or Mud Turtles

The range of the Common Mud Turtle must be given as the eastern United States, from New York to the Gulf of Mexico and westward to the Mississippi Valley. It may extend farther westward but there appears to be rather a mix-up of western records and a tendency to confuse this with an altogether different species.

From this *habitat*, it will be observed that the Common Mud Turtle does not extend as far northward as its common eastern associate and ally—the musk turtle, nor does it occur so abundantly as that species.

Habits.—The habits of this species, and, in fact of all of the Mud Turtles, have practically been described under the head of the common musk turtle. The Mud Turtles are at perfect ease for an indefinite time in a deep tank of water without footing or support upon the surface. They are strictly aquatic in habits when in a wild state and prowl about the muddy bottoms of rivers and ponds in the search for food.

THE LOUISIANA MUD TURTLE

Cinosternum louisianæ, (Baur)

This turtle is most nearly allied to *C. pennsylvanicum*, but may be recognised by its more elongated shell and pronounced markings of the head—*arranged in bands*.

Colouration.—Upper shell dull olive, the margins of the larger shields narrowly margined with black. Plastron dull yellow.

The head is strikingly marked and in a fashion that causes the species to differ from all the others of the genus. Beginning at the snout and extending over the eye is a vivid, orange-yellow stripe, which widens and becomes broken at the rear portion of the head, thence continues on the neck as an orange blotch or band. Beginning at the angle of the jaw is a broader stripe of the same colour, running back to the neck.

Dimensions.—The measurements given do not equal the maximum size attained, but illustrate the general proportions of the shell:

Length of Carapace	3 $\frac{1}{2}$	inches.
Width of "	2 $\frac{1}{2}$	"
Length of Plastron.. ..	3 $\frac{3}{8}$	"
Width, Front Lobe, at Hinge.....	1 $\frac{1}{2}$	"
" " " "	1 $\frac{1}{8}$	"

The Musk or Mud Turtles

Distribution.—The exact range of this species is not well known. It has been given as Louisiana, from which state, all of the writer's specimens have been received. In Louisiana this species appears to take the place of the *C. pennsylvanicum*. It is very probable that further investigation will demonstrate this species to occur over a considerable area of the southern Mississippi Valley, and westward, well into Texas.

BAUR'S MUD TURTLE; THE BANDED MUD TURTLE

Cinosternum bauri, (Garman)

In shape of shell, this reptile resembles the preceding species of mud turtles, but *it may be easily recognised by the banded appearance of the carapace.*

Colouration.—The upper shell is brown or olive, with three dull yellow bands extending its entire length. There are two stripes on each side of the head, beginning at the snout and extending backward, above and beneath the eye to the neck.

Very old and worn specimens show but little trace of the bands upon the carapace unless the shell is moistened.

<i>Dimension.</i> —Length of Carapace	3 $\frac{1}{4}$	inches.
Width "	2 $\frac{3}{4}$	"
Length of Plastron.. . . .	3 $\frac{1}{2}$	"
Width of Front Lobe, at Hinge . . .	1 $\frac{1}{4}$	"
" " Rear " " . . .	1 $\frac{3}{8}$	"
Width of Head	$\frac{7}{8}$	"

The measurements were taken from a specimen captured at Enterprise, Florida.

Distribution.—The southeastern portion of the United States.

THE YELLOW-NECKED MUD TURTLE

Cinosternum flavescens, (Agassiz)

From the standpoint of form, size and colouration, this species is similar to the common mud turtle, to which it is closely allied. From a technical view it is described as possessing differences in the outlines of the shields composing the plastron—the same pertaining to the sutures between the pectoral and humeral shields. These differences may be studied from the illustrations.

Colouration.—With the greater number of specimens the upper shell is possibly lighter in colour than the carapace

The Musk or Mud Turtles

of the common mud turtle, being yellowish-brown, yellowish-green or olive. The margins of the shields are narrowly bordered with black. The plastron is yellow.

The upper surface of the head is generally uniform olive, while the sides of the head and neck are bright yellow. The eye is bright yellow, with a horizontal bar of black through the centre of the iris.

Male specimens possess much longer tails than the females.*

Dimensions.—Length of Carapace. 4 $\frac{3}{8}$ inches.
Width of " 3 $\frac{1}{4}$ "
Length of Plastron. 4 $\frac{1}{8}$ "
Width of Front Lobe, at Hinge. . . 2 $\frac{1}{4}$ "
" " Rear " " " . . . 2 $\frac{1}{4}$ "

Distribution.—The range of this species is from Arkansas (inclusive) through Texas and into Arizona. It probably inhabits several of the rivers of northern Mexico.

THE ARIZONA MUD TURTLE

Cinosternum henrici, (LeConte)

This is a large species and might be described as intermediate between the species of the genus already considered and the Mexican and Central American species, with which the lobes of the plastron are very wide and the hinges so elastic that the shell closes as tightly as with the true box turtles (*Cistudo*), a character clearly seen in the illustration of the following species—*C. integrum*.

Colouration.—The carapace is brownish-yellow; the plastron pale yellow. Above, the head and neck are dull olive; both are thickly sprinkled with yellow on the under surfaces.

Dimensions.—The species attains a length of five or six inches.

Distribution.—Arizona and New Mexico.

THE MEXICAN MUD TURTLE

Cinosternum integrum, (LeConte)

Although this species does not occur in the United States, it ranges well into the northern portion of Mexico. Its description is given as representing the type of the tropical species of this genus.

* A character to be noted with all the species.



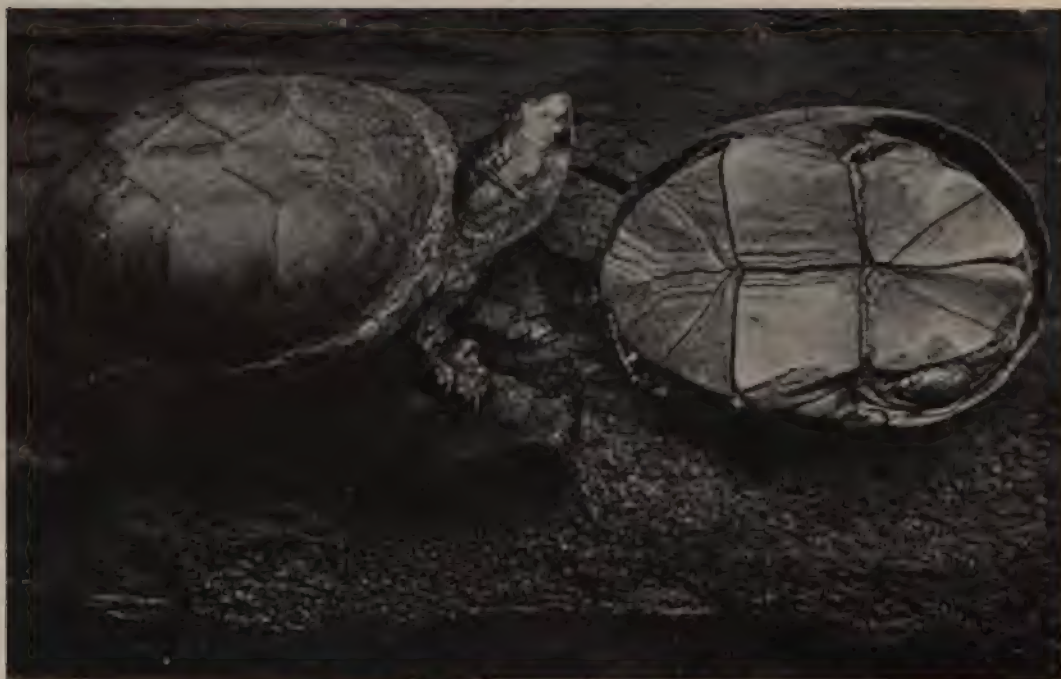
LOUISIANA MUD TURTLE, *Cinosternum louisianae*

Like all the species of its genus it is persistently aquatic. Immediately told by the bright orange bands on the sides of the head



BANDED MUD TURTLE, *Cinosternum bauri*

Distinguished from the other species of *Cinosternum* in having bands on the upper shell. Confined to Georgia and Florida



YELLOW-NECKED MUD TURTLE, *Cinosternum flavescens*

The upper shell is yellowish-brown or olive and the sides of the neck bright yellow. Inhabits the southwestern portion of the United States



ARIZONA MUD TURTLE, *Cinosternum henrici*

Largest of the North American mud turtles. A full-grown shell is six inches long. The under shell has a crushed-in appearance. The range embraces the rivers of New Mexico and Arizona

The Musk or Mud Turtle,

The lobes of the plastron are very wide and when closed against the upper shell, form such a perfect union that it is difficult to insert a straw between any portion. The general effect of the under surface is quite different than with the species considered except *C. henrici*, as the bridge of the plastron is very flat—in fact, it cannot be termed a bridge, for the entire surface of the under shell is flush with the edge of the carapace. The characteristic notch at the rear of the plastron, is but feebly represented.

This species has a large head and strong jaws. The tail of male specimens terminates in a nail-like spine.

Colouration.—Like the majority of the species the upper shell is dull olive or brown, the shields narrowly bordered with black. The plastron is pale yellow, with clouded brown markings at the edges of the shields.

The head is dull yellow, speckled or marbled with black.

Dimensions.—The measurements given are of an adult specimen (male) from Sinola, west coast of Mexico:

Length of Carapace	.....	6 inches.
Width "	.....	3 $\frac{7}{8}$ "
Length of Plastron	.....	5 $\frac{1}{2}$ "
Width of Front Lobe, at Hinge	.....	2 $\frac{1}{4}$ "
" " Rear " "	.....	2 $\frac{1}{2}$ "
Width of Head	.....	1 $\frac{1}{8}$ "

Distribution.—Mexico, generally in slow-running streams and rivers.

CHAPTER V: THE TERRAPINS

THE GENERA *CHRYSEMYS*, *MALACOCLEMMYS* AND *CHELOPUS*

A Group of Aquatic Chelonians Known Commonly as Pond Turtles and River Turtles. They are Characterised by Their Broad, Flat Shell. Most of the Species are Edible

THE term "Terrapin" is a convenient one, for under this appropriate, popular head we may group all of the North American "turtles," or semi-aquatic chelonians, except the Soft-shelled Turtles (*Trionychidæ*), the Snapping Turtles (*Chelydridæ*) and the Musk Turtles (*Cinosternidæ*).

Classification of the Terrapins.—The Terrapins are embraced in the large family *Testudinidæ*; three genera are represented in North America. The largest genus is *Cbrysemys*; it contains the largest species and its members range over the United States generally, though most of them inhabit the southeastern portion; others occur in Mexico, Central America, South America and the West Indies. *Malacoclemmys* is a small genus, confined to the central and eastern portions of the United States. *Chelopus* is also a small genus and the species occur only in the United States.

The Terrapins frequent the borders of ponds, brooks and rivers—some, the salt marshes of the eastern coast. They are characterised by their broad, flattened shell—quite smooth with the majority of them. The hind feet are extensively webbed; all of these animals are excellent swimmers. Many of the species of *Cbrysemys* have very long, sharp claws on both pair of feet.

Of all the Terrapins, the "Diamond-back," (*Malacoclemmys palustris*), is the most familiar, as it is a favourite though costly article of food and a by-word of the eastern markets. The larger species of *Cbrysemys* and several of those belonging to *Malacoclemmys* are sold in large numbers, but always at a far less price than the Diamond-back. The former turtles, often seen in large numbers in the markets where they are kept in cold

vats to prevent them losing fat, are known commercially and collectively as "Sliders." Large examples sell at \$1.50 to \$2.00, while considerably smaller Diamond-backs—about eight inches long—are worth fully \$60.00 a dozen. The species of *Chelopus* are worthless for market purposes.

Definition of the Genera

- A. Size moderate to large. 6 to 14 inches.
Shell broad and flattened, with some species rising to a very blunt apex. No concentric grooves on shields, but numerous parallel furrows, extending lengthwise on many of the species. Claws very long.
Genus *Chrysemys*.
Shell flattened, but rising in the centre to rather a sharp apex, surmounted by a strongly-defined keel. Shields smooth, or with concentric grooves.
Genus *Malacoclemmys*.
- B. Size smaller—from 3 to 8 inches.
Shell low and bluntly rounded. Smooth or with concentric rings.
Genus *Chelopus*.

The Genus *Chrysemys*.—The exact standing of these turtles in the United States, as concerns the number of species, is doubtful. These terrapin are quite variable, both in the conformation of the shell and in colouration. The writer has before him a series of shells of the Cumberland Terrapin, (*Chrysemys elegans*). There is a degree of variation in the outlines of the carapace that might greatly confuse the novice. Some of the shells are quite high and have a tendency to be globular; others rise to a blunt apex and are surmounted by a strong keel; a few are decidedly flattened, with a blunt keel. The colouration of the series is likewise variable. Such conditions exist among most of the species. Thus it will be understood that the genus is a difficult one to describe in a popular manner. As little technical work has been done with genus, since the writings of the late Dr. Baur, there are no books of reference to aid in the comparison of various specimens. The writer has given much thought to these terrapin, and has examined fine series of most of the species, but he has encountered many troublesome problems that would take many months of investigation—and many more specimens—to solve. Following his idea to exclude technical phraseology from this work, the writer has found it a hard matter to define one species from another.

The Terrapins

KEY TO THE SPECIES OF CHRYSEMYS

Division I. Carapace perfectly smooth and rounded without a keel and not serrated at the rear margin.

Size, from 5 to 8 inches.

- a. Bright red markings on upper and lower marginal shields of carapace.

Dark olive above; shields with *wide*, yellowish borders. *Plastron immaculate yellow.*

EASTERN PAINTED TERRAPIN, *C. picta*.

Distribution.—Eastern North America.

Carapace dark olive, the shields with *narrow*, yellowish margins. *Plastron yellow, with a long black patch in centre.*

WESTERN PAINTED TERRAPIN, *C. marginata*.

Carapace dark olive or brown; shields with very narrow, or no yellow margins, but traversed by vein-like, yellow lines. *Plastron yellow, with symmetrical, black markings in the centre.*

BELL'S PAINTED TERRAPIN, *C. belli*.

Distribution.—United States, west of the Mississippi and Ohio Rivers.

- b. No red markings on upper or lower margins of carapace; latter yellow, with or without black spots.

Olive or brown above, with a net-work of fine yellow lines; *plastron immaculate yellow.*

CHICKEN TURTLE, *C. reticulatus*.

Distribution.—Southeastern United States.

Division II. Shell smooth or with numerous parallel grooves; *serrated at rear margin.*

Size, from 10 to 14 inches.

- c. Carapace flat, *smooth*, serrated at rear.

Carapace olive, with large, black blotches; no yellow markings. Head dull olive.

TROOST'S TERRAPIN, *C. troosti*.

Distribution.—States bordering the Mississippi—to Illinois.

Carapace olive, divided into various sized and shaped areas by yellow bands, the spaces containing concentric, yellow lines.

HIEROGLYPHIC TERRAPIN, *C. hieroglyphica*.

Distribution.—Georgia, northern Alabama and Tennessee.

- d. Carapace flat, *with numerous parallel grooves*; serrated at rear.

§ *Numerous parallel stripes on head and neck, all of which are yellow.*

The Terrapins

Shell broad and flat. Carapace olive or brown, with numerous, black-edged, transverse, yellow bands. Plastron yellow. Edges of jaws but slightly serrated.

BARRED TERRAPIN, *C. concinna*.

Distribution.—Illinois to the Gulf States and eastward.

Carapace higher and more constricted at sides than that of preceding; olive or black, with reddish cross-bars. Plastron red or deep orange. Edges of jaws strongly serrated.

RED-BELLIED TERRAPIN, *C. rubriventris*.

Distribution.—New York to Ohio; southward to Florida.

Carapace similar to preceding in form; the paler markings run together, in reticulated fashion. Jaws serrated.

TEXAS TERRAPIN, *C. texana*.

Distribution.—Texas.

§§ Broadest band on head, red; narrow bands yellow.

Carapace olive or brown, barred with yellow. Plastron yellow, blotched with black.

CUMBERLAND TERRAPIN, *C. elegans*.

Distribution.—Central States—Illinois to Texas.

§§§ No longitudinal stripes on head of adult; a yellow bar behind eye.

Carapace with thickly crowded, parallel furrows; blackish with dull yellow cross-bars. Plastron usually immaculate, lemon yellow.

YELLOW-BELLIED TERRAPIN, *C. scabra*.

Distribution.—North Carolina to Georgia.

Division III. Carapace high and globular in front; numerous parallel grooves.

Carapace moderately high, richly barred with yellow, but slightly serrated in rear. Plastron yellow, clouded with brown. A broad band from below eye to throat; a yellow spot on each temple; other head markings in fine lines.

PENINSULA TERRAPIN, *C. nebulosa*.

Distribution.—Lower California.

Shell distinctly globular. Markings of carapace similar to *C. rubriventris*: plastron yellow, with narrow brown markings.

ALABAMA TERRAPIN, *C. alabamensis*.

Distribution.—Alabama.

The Terrapins

Similar to preceding, but the upper jaw is very finely, instead of coarsely serrated.

MOBILE TERRAPIN, *C. mobiliensis*.

Distribution.—Southern portions of the Gulf States.
Division IV. *Shell very high and globular in front; numerous parallel grooves.*

Head very small, with fine, yellow lines.

Carapace black, with yellow bands. Plastron immaculate, lemon yellow.

FLORIDA TERRAPIN, *C. floridana*.

Distribution.—Georgia and Florida.

THE PAINTED TERRAPIN: POND TURTLE

Cbrysemys picta, (Herm.)

Carapace flat and perfectly smooth, the borders evenly rounded. Plastron wide—no notches. Maximum length about six inches.

Colouration.—Carapace dark olive, brown or black, the shields quite widely margined with greenish yellow; marginal shields of the carapace—above and beneath, bordered with crimson and containing blotches and crescentic markings of that hue. Plastron immaculate yellow.

The crimson markings are particularly bright on young specimens; very young individuals have a broad, yellow band on the back. On very old specimens there is little or no trace of red on the upper marginal shields, though the lower shields nearly always show this characteristic colour.

Head black, striped with yellow; the neck and the limbs are striped with a similar red as seen on the marginal shields.

Dimensions.—A large example has a carapace about six inches long, but such is above the average dimensions, which are given:

Length of Carapace	4 $\frac{1}{2}$ inches.
Width of "	3 $\frac{1}{2}$ "
Length of Plastron	4 $\frac{1}{2}$ "
Width of Plastron to junction with upper shell, 3 $\frac{1}{2}$ "	

Distribution.—Eastern North America—from New Brunswick to the Gulf of Mexico. In the extreme South it extends westward to Louisiana. It is particularly abundant in the Middle Atlantic States.

Habits.—Basking on a partially submerged log or miniature island of bunch-grass and plunging into the water when



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EASTERN PAINTED TURTLE, *Chrysemys picta*.

A familiar terrapin of eastern North America. The bright markings alone are sufficient for identification.



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WESTERN PAINTED TURTLE, *Chrysemys marginata*.

Distinguished from the preceding species by the narrower yellow margins on the shields of the upper shell and an elongate black patch on the plastron. Found in the Central States.

The Terrapins

frightened, the Painted Terrapin forms a typical representative of the pond turtles, which depend upon the water to such an extent that they are unable to feed unless beneath the surface of this element. The food consists of aquatic insects, tadpoles, fishes and water plants.

Not difficult to capture and very attractive in its colouration, this terrapin is frequently seen in a captive state, but as an inmate of an aquarium it is not only annoying, but dangerous to the other life, as it will swim after the fishes, biting at their fins and tails, and, if they be small enough, overpowering and eating them. It is fond of raw chopped beef, chopped fish, earthworms and soft-bodied insect larvae. If lettuce leaves be left floating on the water, it will browse upon these.

THE WESTERN PAINTED TERRAPIN

Chrysemys marginata, (Agassiz)

Size and structure of the shell, like the preceding. Differs only in the colouration.

Colouration.—The brilliant red markings on the upper and lower marginal shields of the carapace, are present, but the yellowish borders of the larger shields are very narrow, as compared with *C. picta*. Another difference, is the presence of a large, blackish patch in the central portion of the plastron.

Dimensions.—Length of Carapace 5½ inches.
Width of " 3¾ "
Length of Plastron 5 "

The largest specimen examined had a carapace six inches long.

Distribution.—The Central States, from western New York to Iowa; possibly extends as far south as Louisiana.

BELL'S TERRAPIN

Chrysemys belli, (Gray)

In shape the carapace is similar to the two preceding species, but this is a larger terrapin. It is most nearly allied to *C. cinerea*.

Colouration.—Carapace dark olive or brown; the yellowish borders on the larger shields to be noted with the two preceding terrapin, are very narrow, or absent. On some specimens the shields are narrowly margined with black. Traversing the

The Terrapins

carapace are irregular, vein-like lines, usually crossing the centres of the shields.

The markings of the under, marginal shields of the carapace are less brilliant than with the allied species; the red bars may be present but they are of a dull hue.

The symmetrical, black pattern on the plastron, is characteristic. This is well illustrated in the photograph. The markings on the head, neck and limbs appeal to the Western Painted Terrapin, *C. Cinerea*.

Dimensions.—A female specimen from St. Clair County, Illinois, shows the following measurements:

Length of Carapace.....	5½ inches
Width ".....	4½ "
Length of Plastron	5½ "
Total Width ".....	3½ "
Width of Head	1 "

Distribution.—United States west of the Mississippi and Ohio Rivers to British Columbia and eastern Oregon.

THE CHICKEN TURTLE; LONG-NECKED TERRAPIN; RETICULATED TERRAPIN

Chrysemys reticulatus, (Bosc.)

The Chicken Turtle belongs to the first group of the genus, but may be recognised by the following characteristics:

1. The exceedingly long, snake-like neck.
2. The absence of red markings on the upper and lower marginal shields.
3. The yellow bar on each upper marginal shield.
4. The broad, yellow band on the forelimb.
5. The narrow and rather globular shell.

This species grows to a length of eight inches. The shell is narrower and proportionately higher than that of any of the terrapins. Though the neck is extremely long, the head is entirely retractile.

Colouration.—Carapace olive or brown, with a net-work of fine, yellow lines; the under marginal shields are yellow and each contains a black blotch. Plastron immaculate yellow.

On each forelimb is a wide, cream-coloured band; the under surface of the tail and limbs is yellow, as is the greater



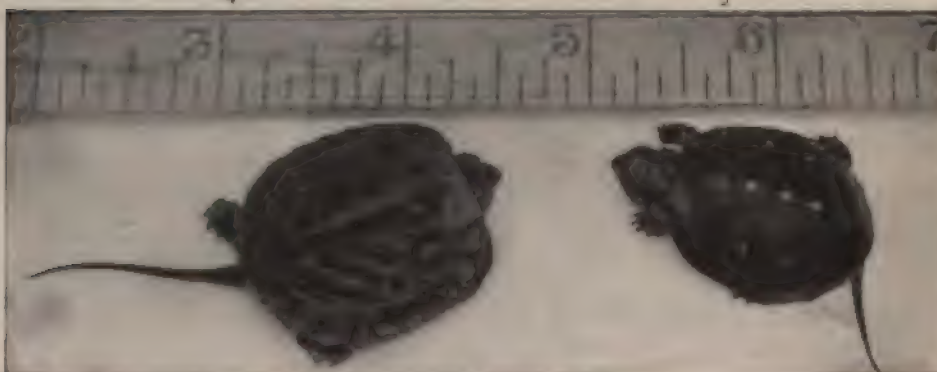
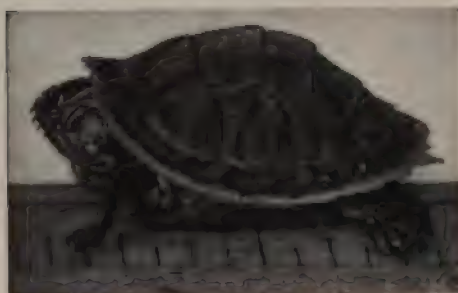
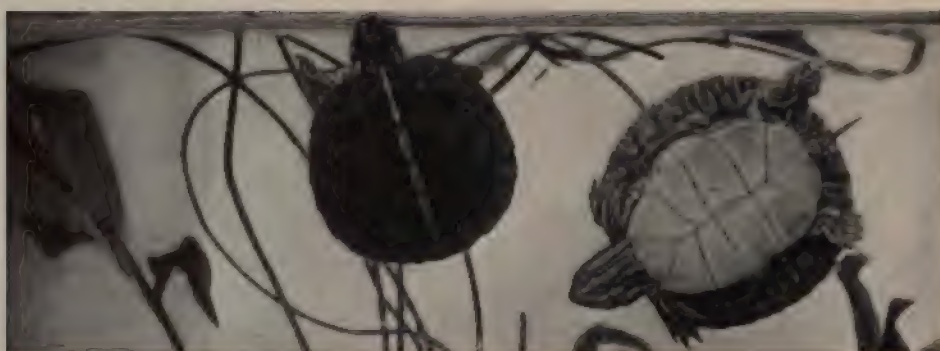
BELL'S TERRAPIN, *Chrysemys bellii*

Found west of the Mississippi and the Ohio rivers. Note the characteristic markings on the under shell



CHICKEN TURTLE, *Chrysemys reticulata*

The neck is very long and snake-like. There is a net-work of fine yellow lines on the upper shell. This turtle is common in the southeastern portion of the United States. A very large shell is about ten inches long



1 Young Painted Terrapin
2 Young Florida Terrapin

3, 4, 5 Young Lesueur's Terrapin
6 Young Wood and Spotted Turtle

The Terrapins

portion of the throat, though there are several pairs of black stripes. Above, the head is traversed by narrow stripes.

Dimensions.—A moderate-sized example from Baker Co., Ga., shows these measurements:

Length of Carapace	.....	5 $\frac{1}{8}$	inches.
Width of	.....	3 $\frac{1}{4}$	"
Length of Plastron	.....	4 $\frac{3}{8}$	"
Width, Flat Portion, Plastron	.....	1 $\frac{7}{8}$	"
Length of Head and Neck	.....	4	"
Width of Head	.....	$\frac{7}{8}$	"

The largest specimen examined by the writer was 8 $\frac{1}{4}$ inches long (carapace) and weighed 3 $\frac{1}{4}$ pounds. The shell was black and all trace of the yellow, reticulated pattern had faded with age; the entire carapace was so covered with small furrows as to appear dull and lustreless. This turtle was taken near Orlando, Florida.

Distribution.—States east of the Mississippi River, from North Carolina to Florida (inclusive).

TROOST'S TERRAPIN

Chrysemys troosti, (Holbrook)

Size large—carapace ten inches; shell flat. The carapace is bluntly rounded in front; more sharply rounded in the rear with dull serrations between the marginal shields and in the centre of each of them; upper shell usually quite smooth—sometimes furrowed on the sides.

Colouration.—Owing to the lack of yellow stripes on the head, neck and limbs, this species is distinct from the others. On a few examples obscure, greenish stripes may be seen on the head and neck, but unless examined closely, these organs seem to be of a uniform hue. The effect is very different from the vividly-striped head of nearly all the larger terrapin.

The colouration of the shell is also characteristic. The carapace is olive, profusely blotched with black and irregularly so, except on the marginal shields, where the black is present at their junctions. Plastron yellow, blotched with black.

<i>Dimensions.</i> —Length of Carapace	.....	8 $\frac{1}{2}$	inches.
Width of	.....	6 $\frac{1}{2}$	"
Length of Plastron	.....	7 $\frac{7}{8}$	"
Width, Flat Portion, Plastron	....	4	"
Height of Shell	.....	2 $\frac{3}{4}$	"
Width of Head	.....	1 $\frac{3}{8}$	"

The Terrapins

These measurements are an average from several hundred examples from Fulton Market, New York.

As with most of the terrapin, the claws, particularly of the front feet, are very long; the longest claw on the front foot, of a reptile agreeing with the above measurements, was $\frac{7}{8}$ of an inch long.

Distribution.—Missouri, Illinois, Tennessee and Mississippi. Large numbers are received at the markets from Illinois.

HIEROGLYPHIC TERRAPIN

Chrysemys hieroglyphica, (Holbrook)

Shell very flat; carapace of the adult perfectly smooth. Rear margin of the carapace more deeply notched than that of the preceding. In proportion to the size of the shell, the head is very small and narrow.

Colouration.—Carapace olive-brown, traversed by rather broad, yellow bands that divide it into various-sized areas, each of which contains narrow, concentric lines of yellow. Plastron yellow; a dark blotch on the border of each marginal shield.

Dimensions.—An adult example has a carapace about twelve inches long; the height of the shell is about three inches.

Distribution.—Georgia, Alabama and Tennessee.

THE BARRED TERRAPIN; RED-NECKED TERRAPIN; COOTER

Chrysemys concinna, (LeConte)

Shell broad and flat; bluntly serrated at the rear; carapace furrowed or wrinkled (*rugose*) on the sides.

Colouration.—Carapace olive, with numerous, irregular wavy lines and bands extending downward; these are generally edged with a darker hue than the ground colour. There is a yellow, vertical line in the centre of each of the upper, marginal plates, and fine, yellow, ring-like (concentric) markings, crossing from one shield to another. Along the lower, marginal shields is a single row of large, dark blotches. Plastron usually uniform yellow.

The markings on the upper shell resemble those of *C. elegans*—the Cumberland Terrapin, but the arrangement of the stripes on the head is quite different.

Head Markings.—Head black, with rich, orange yellow or red

The Terrapins

stripes. On the top of the head is a narrow bar, about five-eighths of an inch in length (on an adult of average size); back of this and to each side of it, are very narrow, forked stripes. A narrow stripe borders the eye above, thence extends over the temples where it broadens and runs to the neck; from behind the eye is another band, extending to the neck; beneath the eye is a wide stripe which forks, one portion passing toward the chin and the other backward to the neck. A broad, forked band on the middle of the chin.

Dimensions.—Length of Carapace 12 inches.
 Width of " 8½ "
 Height of " 4½ "
 Width of Head 1½ "

Distribution.—The Southeastern United States, from the Carolinas southward to Florida; westward to Missouri.

THE FLORIDA TERRAPIN

Chrysemys floridana, (LeConte)

At once distinguished by the very high and dome-like carapace and the diminutive head. One of the largest species.

Colouration.—Carapace black or dark brown, with wavy yellow crossbars. Each of the marginal shields has a single, vertical yellow line in the centre; here we note a difference in pattern from the most nearly related species, the Mobile Terrapin* and the Cooter.* on both of which the marginal shields contain, besides the upright bar, numerous concentric lines of the same colour.

The plastron of the Florida Terrapin is immaculate lemon yellow.

Head intensely black, with a few, fine, yellow lines. The most vivid stripe is from behind the eye to the neck; the chin stripes are wide.

Dimensions.—Following are the measurements of an example from the St. John's River, Florida:

Length of Carapace 13 inches.
 Height of Shell† 5½ "
 Width of Carapace 9 "
 Length of Plastron 12½ "
 Width, Flat Portion, of Plastron 5 "
 Width of Head† 1½ "
 Weight 14½ lbs.

* *Chrysemys mobiliensis* and *C. concinna*.

† Note the very high shell and the small head.

The Terrapins

Small or even half-grown individuals do not exhibit the marked, globular formation of the carapace; their shell is much like that of *C. concinna*; the dome-like development appears with maturity.

Distribution.—From the records at hand, this species seems to be restricted to southern Georgia and Florida.

THE MOBILE TERRAPIN

Chrysemys mobiliensis, (Holbrook)

Another terrapin characterised by the globular formation of the front of the carapace, though to a lesser degree than with *C. floridana*. This species is distinguished by the very fine serrations of the upper jaw.

Colouration.—Markings very similar to *C. concinna*. Though the carapace is more highly arched than with that species, some authorities consider the Mobile Terrapin to be but a larger, Southern race of it. We will provisionally treat this reptile as distinct, owing to its higher shell and finely serrated upper mandible.

Dimensions.—Attains a length of 14 inches.

Distribution.—Southern portions of the Gulf States.

THE ALABAMA TERRAPIN

Chrysemys ababamensis, (Baur)

Carapace rather high and globular in the front. Head of fair size.

Colouration.—The pattern above is much like that of *C. rubriventris*, but the plastron is yellow instead of deep orange or red, and is marked with brown reticulations.

Dimensions.—The carapace of an adult example is about 12 inches long.

Distribution.—The type specimens were taken near Mobile Bay, Alabama, which locality points to the species displaying a tendency to frequent salt marshes.

THE RED-BELLIED TERRAPIN

Chrysemys rubriventris, (LeConte)

Differs from the preceding in the much narrower shell, which is well rounded at the front and rear borders; the jaws are deeply serrated.

The Terrapins

Colouration.—The carapace is brownish or olive, with blotches, streaks or irregular bands of red. Each of the marginal shields, both above and beneath, have a reddish band passing through the centre. Plastron usually dull red, or deep orange, tinged with red at the borders.

Head markings.—Head and neck dark brown, with obscure, reddish bands; two distinct, narrow, reddish-yellow lines from behind the eye to the neck, broad, red bands on the throat.

Dimensions.—Grows to a length of about twelve inches; the width of a specimen this size would be about $7\frac{1}{2}$ inches and the height of the shell about $4\frac{1}{2}$ inches.

Distribution.—Occurs in eastern Ohio, Pennsylvania, New Jersey, Delaware, Maryland, the two Virginias and northern North Carolina. It is numerous in the Delaware River, in New Jersey and commonly sold in the larger markets.

Habits.—This terrapin occurs principally in rivers with a rocky bed.

THE YELLOW-BELLIED TERRAPIN

Cbrysemys scabra, (Agassiz)

The carapace of this terrapin is the most deeply grooved of any of the species; this rugose characteristic is at once striking, upon a gross examination of the shell. There is a dull keel on the central portion; the rear border is notched. Head rather large.

Colouration.—Carapace olive, brown or black, with dull, yellow bands extending downward from the central portion. The illustration of an example under water, clearly delineates these markings.

With the adult, there are practically no narrow, yellow lines on the head, except a single yellow stripe on the crown. Behind the eye is a broad, upright, yellow bar—this, sometimes in the shape of a thick C—occasionally, though rarely, it is seen as a wide band, from the eye to the angle of the mouth; from the tip of the snout to the upper mandible is another yellow bar.

Plastron usually immaculate yellow. Lower marginal shields of carapace yellow; a dark blotch in each.

Dimensions.—Average length of carapace 10 inches; width, $6\frac{1}{2}$; length of plastron, $9\frac{1}{2}$ inches; height of shell, $3\frac{3}{4}$ inches.

The Terrapins

Distribution.—The range of the Yellow-bellied Terrapin is restricted.

It occurs from Virginia to Georgia. Holbrook says it does not extend into the interior. He was not aware of its existence two hundred miles from the coast. It lives about pools of stagnant water and in marshes, where specimens may be seen sunning on derelict timber. Large numbers are brought to the Charleston markets, where they are sold at a much lower figure than the diamond-back terrapin—*Malacoclemmys palustris*.

THE CUMBERLAND TERRAPIN

Chrysemys elegans, (Wied)

Outlines of the shell similar to the preceding, but the carapace is not so deeply furrowed.

Colouration.—Markings on the carapace similar to *C. scripta*, but the colouration of the plastron and head is entirely different. Plastron yellow, densely clouded with black or dark brown.

Head markings.—The pattern of the head is constant, vivid and characteristic. Top and sides of the head with crowded, pale greenish-yellow lines; *from the eye to the base of the head is a broad band of rich crimson*.

Dimensions.—Average length of carapace, 10 inches; width, 7½ inches; length of plastron, 9½ inches.

Distribution.—Extends over a considerable area—Ohio to Kansas, southward to the Gulf States and to the lower Rio Grande River.

Habits.—Very hardy as a captive. It eats chopped fish and meat, and very tender green vegetables that may be thrown upon the water. Large numbers may be seen in the markets, where they are sold as "Sliders."

THE TEXAS TERRAPIN

Chrysemys texana, (Baur)

Shell rather flat; not deeply furrowed. Head of fair size.

The original description* reads: "Skull small, similar to *P.† rubriventris*. Upper jaw notched in the centre, with a rounded tooth on each side, not so prominent as in *P. rubriventris*. Lower jaw similar to *P. rubriventris*."

* *Proc. Am. Philosophical Society*. Phila. XXXI, No. 141, page 223.

† Stands for *Pseudemys*—a generic name proposed for the terrapins.



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YELLOW-BELLIED TERRAPIN. *Chrysemys scabra.*

One of the market terrapins. A full-grown shell is about eleven inches long and characterised by numerous parallel furrows. Found in the coast region—North Carolina to Georgia.



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CUMBERLAND TERRAPIN. *Chrysemys elegans.*

Closely allied to *C. scabra*, though at once distinct by the red band on each side of the head. Occurs in the Central States—Illinois to Texas.

The Terrapins

Colouration.—"The colouration of the head is quite different from the other species. A yellow, longitudinal spot behind the eye; behind this a yellow line, ending in a long longitudinal spot above the temples; from the lower, posterior portion of the eye a yellow line appears, sending a branch upward in front of the tympanic cavity, and continues behind on the neck. Three very strong yellow and some slender yellow stripes on lower face of neck."

Distribution.—Texas and probably northern Mexico. Has been taken at San Antonio and along the Pecos River.

THE PENINSULA TERRAPIN

Chrysemys nebulosa, (Van Denburgh)

Allied to a Mexican and Central American species—*C. ornata*. The shell is of moderate height, bluntly keeled and rugose on the sides.

Colouration.—Carapace olive, with numerous yellow and irregular yellow bands and blotches. A black blotch in each marginal shield, above and beneath. Plastron yellow, clouded with brown in the central portion.

Head dark brown, marked with fine, wavy lines on the top; a broad band from beneath the eye to the throat; a yellow blotch on each temple, continued backward on the neck as a narrow band.

Dimensions.—Reaches a length of 12 inches.

Distribution.—Southern portion of the peninsula of Lower California.

The Genus *Malacoclemmys*: The six species comprising this genus are of large size—from 8 to 12 inches in length. Excluding one species, which has a very rough shell—the Diamond-back Terrapin—these turtles exhibit a strong similarity to the species of the preceding genus, and like them, are sold in great numbers in the markets as "Slider" terrapin, with the exception of the "Diamond-back." That species is the choice, over all other terrapin, by the epicures, and brings four or five times the price of species that are included within the genus to which it belongs, though the former may considerably exceed it in size.

The species of this genus are characterised, among the terrapin, by the strong keel upon the carapace—this usually

The Terrapins

protruding so abruptly from the shell as to produce a bluntly serrated margin to the curve of the back. The species have very large and extensively webbed hind feet. The claws of the front feet do not exhibit the extensive development to be noted with the species of the preceding genus.

From *Chrysemys*, this genus is technically separated by the structure, in the latter, of the inner margin of the jaws, which, immediately within the sharp edge of the mandibles, are provided with very broad and flat crushing surfaces. Upon an examination of these crushing surfaces, theory would point to a food consisting of molluscs. Such is actually the case. Most of these turtles have been found to feed largely upon small species of snails.

Male and female specimens differ considerably in size, the females being much larger and with *proportionately larger* heads than the males.

The tail of male specimens is long and thick, proportionately longer than with any species of *Chrysemys*.

Following is a key to the species of *Malacoclemmys*:

Shell broad and flat with all the species; not globular: rising to rather a sharp apex which is surmounted by a broken keel, represented by high, ridge-like nodules.

a. Shell smooth, with a dull lustre.

*Keel moderately developed, not rising in the form of tubercles.

Olive, sometimes with black blotches.

A net-work of fine, yellow lines.

GEOGRAPHIC TERRAPIN, *M. geographica*

Distribution.—Mississippi Valley and western portions of Atlantic states.

**Keel rising in the form of tubercles, giving line of back a serrated appearance.

Olive, with large, round, black blotches.

No yellow net-work. Head with narrow, yellow lines and a wider, yellow crescent behind eye.

LESUEUR'S TERRAPIN, *M. lesueurii*.

Distribution.—Mississippi Valley.

Carapace like preceding. A large yellow *spot* behind eye. A narrow line from above eye; shorter lines beneath.

KOHN'S TERRAPIN, *M. kohnii*.

Distribution.—Lower Mississippi Valley.

Pale, olive; no large blotches; marginal shields marked with yellow. Space between the eyes with a broad, yellow figure, splitting into bands behind the eyes.

BAUR'S TERRAPIN, *M. pulchra*.

The Terrapins

Distribution.—Taken only on the Alabama River. Olive; each of the shields enclose a yellow ring bordered inside and outside with dark brown. A yellow spot behind eye and two yellow stripes to the neck. OCCELLATED TERRAPIN, *M. oculifera*.

Distribution.—Lower Mississippi Valley.

- b. Shell rough, the shields enclosing raised, concentric areas. Dull brownish or olive. Head pale gray with black dots. DIAMOND-BACK TERRAPIN, *M. palustris*.

Distribution.—Salt marshes of the Atlantic coast and Gulf of Mexico.

Detailed descriptions of these species follow:

THE GEOGRAPHIC TERRAPIN; MAP TURTLE

Malacoclemmys geographica, (Lesueur)

The species grows to a considerable size—10 to 12 inches. The females are considerably larger than the males and have proportionately very large heads. The carapace is rather flat and flaring at the rear margin, where the junction of the shields form moderate notches. On the centre of the carapace is a well-defined, but dull keel. The surface of the carapace is quite smooth and exhibits a dull lustre with adult specimens, though faint ridges are usually to be seen on the sides.

Colouration.—The carapace is dull olive, with a fine and irregular net-work of yellow lines. These markings are very indistinct on some specimens and show only when the shell is moist. Some specimens have many dark blotches on the carapace. The marginal shields of the *under side* of the carapace are peculiarly marked; they are yellow and contain round, olive markings, consisting of one ring within another, but on very old specimens these markings may be present merely in the form of a dull blotch.

The plastron is yellow and immaculate, with the exception of very narrow borders of darker colours following the edges of the shields across the shell.

Head markings.—The head and neck are very dark olive, with many narrow and parallel, greenish-yellow lines. These lines are more numerous than is the case with the other terrapin. A short distance behind the eye is a *triangular spot* of the same colour as the stripes.

The tail of male specimens is long—almost half the length of the plastron—and brightly striped with yellow.

The Terrapins

Dimensions.—The measurements quoted are from a fair-sized female specimen, taken near Sandusky, Ohio:

Total length of Carapace	9½	inches.
Width of Carapace	7½	"
Length of Plastron	8	"
Width, Flat Portion, of Plastron	4	"
Width of Head	1½	"

A specimen of this size will weigh about three and a half pounds and sells for about seventy-five cents in the eastern markets.

Distribution.—The species is abundant in the Valley of the Mississippi, whence, in the North it extends eastward into Pennsylvania and New York to Lake Champlain. It occurs as far south as Louisiana.

Habits.—Judging from his experiences with several hundred specimens of this turtle, both in the tanks of the reptile house of the New York Zoölogical Park and with specimens that were liberated in small ponds of the Park, the writer believes this to be a delicate species when removed from its native environment. It will eat chopped fish, meat and mealworms, also earthworms and various soft-bodied grubs, dragging all its food into the water and devouring it beneath the surface. The writer has also observed it to eat the edges of water-lily pads. None of the specimens liberated in the Park ponds passed through the winter alive—all floating up dead in the spring. The ponds appeared to be very favorable for the life of such creatures as there was a soft mud bottom in which they could burrow for the winter. The experiment was continued for several winters, but with a like result. It appeared that some item of their food was lacking and without it they could not summon sufficient strength to pass the winter months.

LESUEUR'S TERRAPIN

Malacoclemmys lesueurii, (Gray)

Attains the same length as the preceding species. The carapace is flaring at the rear and strongly notched at the sutures of the marginal shields. The centre of the carapace rises rather sharply and is surmounted by a high keel, broken into a series of tubercles—one in each shield. This formation produces a strongly serrated outline to the curve of the back. The surface

The Terrapins

of the carapace is quite smooth, with a dull lustre, although blunt ridges are discernible on the sides.

Colouration.—The carapace is dull olive, or brownish above, with a few coarse and indistinct yellow lines. *On each of the shields is one or two large blotches of black or dark brown.* These blotches impart a characteristic appearance and greatly assist in separating the species from the Map Terrapin, although the much heavier and tubercular keel is another strong character.

The marginal shields of the underside of the carapace show the dark, concentric blotches like the former species. The plastron is immaculate yellow; occasionally marbled or lined with gray or brown.

Head markings.—The head is large, with sharply-pointed snout and the colouration is quite distinct. There are but few lines on the top of the head, which is dark olive or black. The lines are vivid yellow. One of these begins at the snout and extends backward for a little distance past the eyes where it abruptly terminates. Behind each eye is a bright yellow mark in the form of a crescent, which connects with parallel lines extending along the head and neck. Behind the crescents are finer markings, which on many specimens, fork in vein-like fashion. The limbs and tail are brightly striped.

<i>Dimensions.</i> —Length of Carapace	9 $\frac{3}{4}$	inches
Width of	7 $\frac{1}{4}$	"
Length of Plastron	8 $\frac{1}{4}$	"
Width, Flat Portion, of Plastron ..	4 $\frac{3}{8}$	"
Width of Head ..	2	"

It will be noted, on comparing the different measurements that the head of this species is proportionately large. The measurements are of a female specimen. It was taken in Illinois and weighed exactly four pounds. Specimens like it were selling in the eastern markets—in November—at \$1.25 each, under the title of "Sliders."

Distribution.—Valley of the Mississippi River. The species occurs from Ohio to Mississippi, inclusive.

Habits.—Captive specimens are delicate and live but a few months. They do best if supplied with running water, with means of leaving the same—rockwork or a log. Market-men tell the writer that to keep a large number of specimens alive for some time, it is necessary to keep them very cold—at

The Terrapins

a temperature of about 45° F. They are very fat when received at the markets in the fall and in the cold vaults in which they are usually stored they remain so sluggish that this fat is not "worked off." Placed in an ordinary room temperature they rapidly emaciate.

KOHN'S TERRAPIN

Malacoclemmys kobnii, (Baur)

This species was described by the late Dr. G. Baur in 1890.* He explains that the form of the shell is much like that of another of his new species, technically called *M. oculifera*, and which the writer has popularly termed the Occellated Terrapin.

Colouration.—The carapace resembles that of Lesueur's Terrapin, but the colouration of the head is quite different. There is a large, yellow spot behind the eye, and a thin yellow line, connecting with a shorter one, extending backward from the upper portion of the eye.

Distribution.—The species appears to inhabit those states in and adjacent to the lower Mississippi Valley. It has been taken at Bayou Lafourche, Bayou Teche and St. Martinsville, Louisiana; also near Pensacola, Florida.

BAUR'S TERRAPIN

Malacoclemmys pulchra, (Baur)†

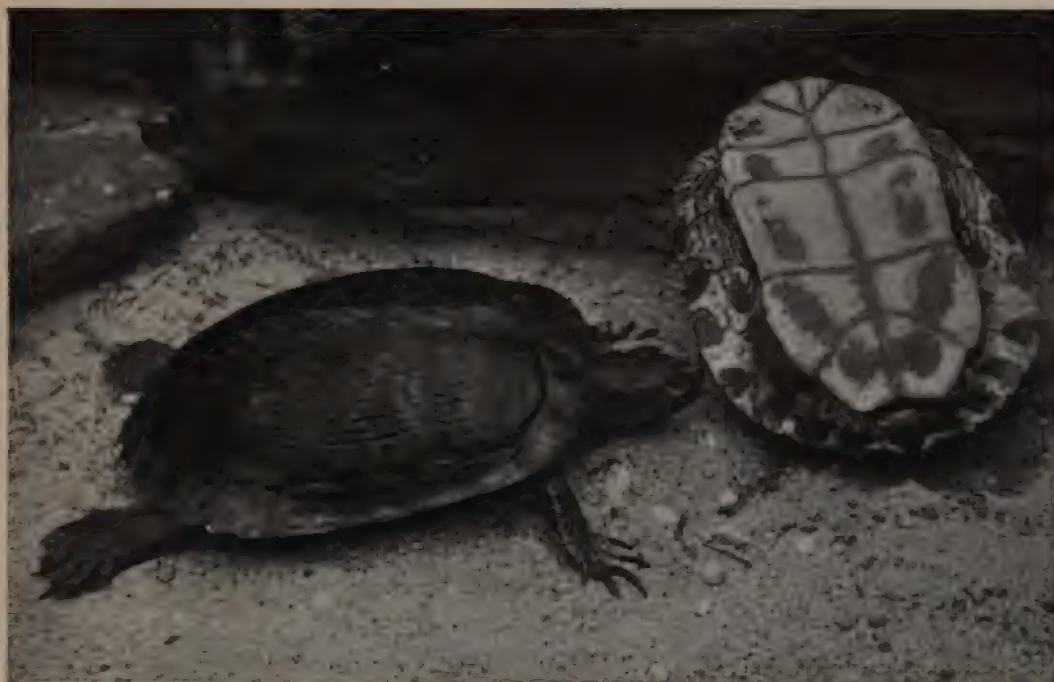
The head markings of this species are the strongest characters for identification. The original description states: "The whole space between and behind the orbits is characterised by a continuous, yellow figure, which sends backward, on each side, behind each orbit, a strong process of the same colour."

The carapace is pale olive, with yellow markings about the margin; the plastron is yellow, with darker markings. The species attains an average size for this genus.

Distribution.—The exact range of the species is not known. The type specimens were taken on the Alabama River, near Montgomery, Alabama.

* *Science*, November 7, 1890. Vol. 16.

† Described by G. Baur in the *American Naturalist* of 1893, p. 675.



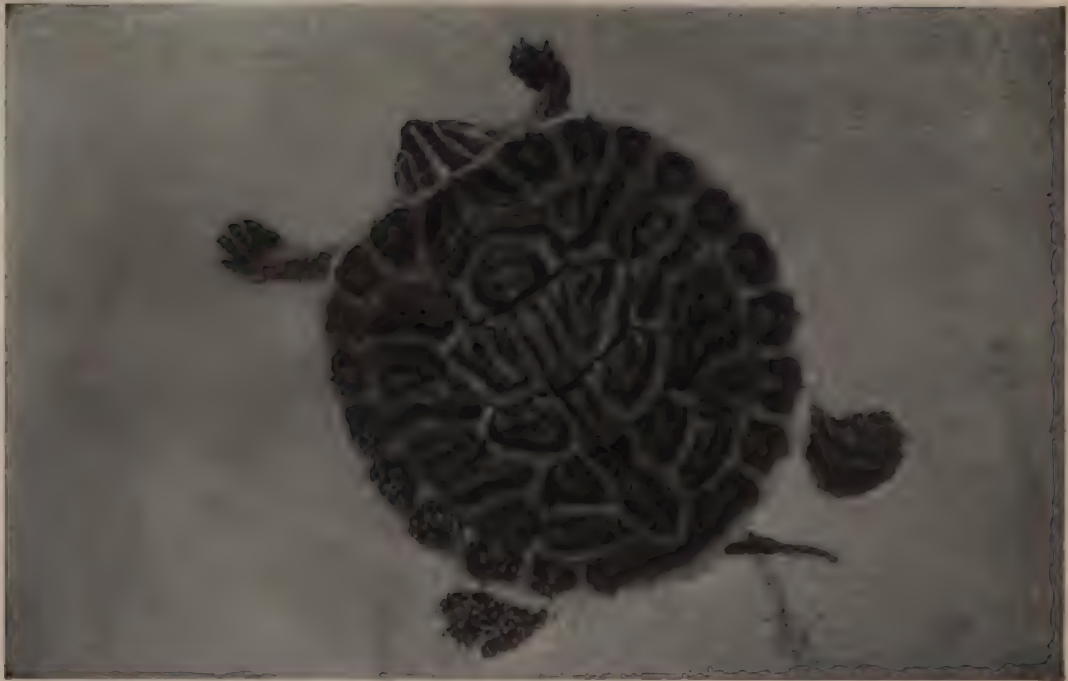
TROOST'S TERRAPIN, *Chrysemys troosti*

One of the larger terrapins sold in the markets under the general title of "Sliders." Among the bigger species of *Chrysemys*, this is the least attractive in colouration



YOUNG OF THE YELLOW-BELLIED TERRAPIN, *Chrysemys scabra*

The young of the various terrapins are vividly marked. The illustrations are life-size



FLORIDA TERRAPIN, *Chrysemys floridana*. Young



FLORIDA TERRAPIN, *Chrysemys floridana*. Adult

Very distinct among the species of *Chrysemys*. The shell is very high—dome-like—and the head proportionately small

THE OCCELLATED TERRAPIN

Malacoclemmys oculifera, (Baur)

Owing to the striking markings of the carapace, this species should be readily identified. The conformation of the shell appeals to Lesueur's Terrapin, but the tubercles on the back are yet more highly developed.

Colouration.—Upper shell olive. Each of the shields contains a yellow ring, which is bordered on the inside and outside with dark olive-brown. The plastron is yellow with darker markings in the central portion.

There is a yellow spot behind the eye and two yellow stripes from the eye backward. Beneath, there is a yellow band covering the whole lower jaw.

Distribution.—The species has been taken at Mandersville, Louisiana, and at Pensacola, Florida.

THE DIAMOND-BACK TERRAPIN

Malacoclemmys palustris, (Gmel.)

The species differs from all the others of its genus in the rough character of the carapace. Each of the shields contains a number of concentric grooves, rising in step-like fashion. It is owing to the angular, and concentric areas embraced by the shields that the popular name—"diamond-back"—has originated. A well-defined keel is represented by a blunt ridge, rising within each of the central shields; the highest of these ridges is in the central or middle shield of the back. Examined from the side, the keel appears as a series of serrations.

Colouration.—The carapace is grayish or olive, sometimes with darker concentric markings which appeal to the arrangement of the grooves. The lower border of the carapace is olive, each plate embracing hollow black squares or blotches. The plastron is deep yellow, with numerous black dots in rows and dusky bands extending crosswise.

With very young specimens the upper shell is almost white, with black, concentric markings.

The head markings of the adult are strong and constant. There are no stripes. The head, neck and all the exposed, fleshy parts are slaty gray, profusely covered with rounded, black dots.

The Terrapins

Carapace black, each shield enclosing a cluster of fine, yellow spots. WESTERN POND TURTLE, *C. marmoratus*.

Distribution.—Pacific Region.

- b. *Shell with coarse, concentric grooves; serrated in the rear.*
Carapace brown. Neck and limbs brick red.

WOOD TERRAPIN, *C. insculptus*.

Distribution.—Eastern States.

Detailed descriptions follow:

THE SPOTTED TURTLE; POND TURTLE

Chelopus guttatus, (Schneider)

Carapace smooth, quite flat and oval in outline. The edges are evenly rounded with no indications of serrations. An adult specimen is from three to four inches long. The feet are sparsely webbed; the upper jaw deeply notched.

Colouration.—Upper shell black, with numerous, irregularly scattered, *round*, yellow spots. The plastron and lower margin of the carapace are black, with patches of faded yellow.

Above, the head is black, with a few yellow spots in front and a larger spot, of a deeper yellow (orange) over the region of the ear. Lower surfaces of the limbs and the fleshy parts, pale salmon.

Dimensions.—The following measurements represent an average-sized specimen:

Length of Carapace	3 $\frac{7}{8}$ inches.
Width " "	2 $\frac{7}{8}$ "
Length of Plastron	3 $\frac{1}{2}$ "
Width, Flat Portion, Plastron	2 $\frac{1}{2}$ "
Width of Head	$\frac{3}{4}$ "

Male specimens have a much longer tail than the other sex. The tail of a male individual with upper shell slightly under 4 inches long, shows a length of 1 $\frac{7}{8}$ inches; the tail of a female specimen of the same length, is but $\frac{3}{4}$ of an inch long.

Distribution.—An abundant species in the Eastern States, ranging from Maine (inclusive) to northern North Carolina and westward to Indiana.

Habits.—The familiar Spotted Turtle is one of the most aquatic species of its genus. It is common about ponds, marshes and small streams, where numerous specimens may be seen, sociably assembled on a floating log or other objects that protrude above the water, whence there is an undignified tumble



GEOGRAPHIC TERRAPIN, *Malacoclemmys geographica*

An abundant species in the Ohio and the Mississippi valleys. The females are much the largest, having a shell about 10 inches long. This terrapin is often sold in the eastern market under the title of "Slider."



LESUEUR'S TERRAPIN, *Malacoclemmys lesueurii*

By the high, serrated back, the peculiar head markings, and the absence of a reticulated pattern, this species is distinguished from the Geographic Terrapin. Common in the Mississippi Valley



DIAMOND BACK TERRAPIN, *Malacoclemmys palustris*, Adult



DIAMOND BACK TERRAPIN, *Malacoclemmys palustris*
Young, above



DIAMOND BACK TERRAPIN, *Malacoclemmys palustris*
Young, beneath

Greatly esteemed as an article of diet. Specimens with a shell 8 inches long bring from \$60 to \$75 per dozen. The species frequents salt marshes of the Atlantic and Gulf coasts.



WOOD TURTLE, *Chelopus intralpinus*

By a bill passed recently in the state of New York, this species is protected from capture and sale in the markets.

and dive for safety upon the slightest disturbance. The writer has found many specimens along brooks that here and there spread into thick grassy spots. It is in this water-grass that the turtles delight to hide, after feeding. The species always feeds under water and, in fact, appears to be unable to swallow unless the head is submerged. The food consists largely of dead fish and the larvæ of aquatic insects. Captive specimens will eat the tender leaves of lettuce if these be thrown upon the surface of their tank. It therefore appears probable that they feed upon various water plants as well, while in a wild condition.

MUHLENBERG'S TURTLE

Chelopus mublenbergii, (Schweigger)

Carapace very similar to that of the preceding, but narrower, and showing fine, concentric grooves on small specimens and young adults.

Colouration.—Carapace black or dull brown, with dull yellowish or reddish markings in the centre of each of the larger shields. These markings look like the outlines of a drop of fluid that has fallen from some height and splashed irregularly in all directions. The plastron is black with yellow blotches.

The head is black, with a large patch of brilliant orange-yellow on each temple.

The higher and narrower carapace, the absence of yellow dots, and the presence of the large and brilliant orange blotches on the temples, at once distinguish this species from the Spotted Turtle.

<i>Dimensions</i> .—Length of Carapace	4	inches.
Width " " " " " " " " " " " " " " " "	2 $\frac{3}{4}$	"
Length of Plastron	3 $\frac{1}{2}$	"
Width, Flat Portion, Plastron . . .	1 $\frac{7}{8}$	"
Length of Tail (Male)	1 $\frac{3}{4}$	"
Width of Head	$\frac{3}{4}$	"

Distribution.—Restricted to the southern portion of New York state, New Jersey generally, and eastern Pennsylvania. It is very rare in some localities and fairly abundant in others. The writer has captured several specimens on the palisades of the Hudson River and received several dozen specimens from Staten Island, New York.

Habits.—In habits Muhlenberg's Turtle occupies a position

The Terrapins

midway between the spotted turtle and the wood terrapin—one quite aquatic; the other addicted to roaming over swampy areas. Mulenberg's Turtle is partial to clear, narrow streams, which spread at intervals, forming marshy patches. All of the specimens taken by the writer were discovered in the latter situations. When alarmed, the reptile makes for the water and endeavours to secrete itself in the aquatic vegetation. Its movements are not very quick and it is readily captured. Unlike the spotted turtle it feeds as readily out of the water as it does beneath the surface. In this respect it appeals to the wood terrapin, and like that species feeds largely upon tender green food, insects and worms. As a captive it is hardy, taking chopped meat, earthworms, mealworms, lettuce and berries.

THE WESTERN POND TURTLE

Chelopus marmoratus, (B. & G.)

When fully mature this western species is about eight inches long. The general proportions and structure of the shell appeal to the spotted turtle, (*C. guttatus*). Young specimens have a single, blunt keel upon the centre of the carapace. This usually disappears altogether with maturity.

Colouration.—Carapace, dark olive, brown or blackish. Each shield encloses an aggregation of yellow dots or dashes—if the latter these tend to radiate from the centre of the shield.

The central portion of the shields of the plastron is yellow. These shields are bordered with black, particularly about the margin. The limbs are brown, closely spotted with black—sometimes yellow; the head is similarly marked.

Dimensions.—Adult specimens are from six to eight inches long and quite smooth.

Distribution.—This is the only fresh-water turtle of the Pacific Region—with the exception of a species in Lower California. It occurs commonly in ponds and rivers in Washington, Oregon and California, west of the Cascade and Sierra Nevada Mountains.

Habits.—Similar to the Eastern spotted turtle. It is quite aquatic and very shy; specimens are commonly seen sunning upon logs and rocks but drop into the water at the least alarm. These turtles often take the hooks of fresh-water fishermen.

THE WOOD TERRAPIN

Chelopus insculptus, (Le Conte)

Carapace with a strong keel; each of the shields contains many concentric grooves, rising, one above the other, to an extent that produces a bulging formation. The entire carapace has a rough, chiseled aspect, hence the specific name—*insculptus*. On the rear margin the carapace is serrated. There is a deep notch at the rear of the plastron.

Colouration.—The upper shell is dull brown, each plate marked with narrow and radiating yellow lines and spots. On the lower edge the carapace is yellow with large, black patches. The plastron is yellow, each plate containing a large patch of black.

The fleshy parts, with the exception of the top of the head and limbs, are bright brick red.

Dimensions.—The measurements of an adult, female specimen are given:

Length of Carapace	6½ inches.
Width " "	5½ "
Length of Plastron	6½ "
Total Width of Plastron	4½ "

Eight inches represents the length of a large specimen.

Distribution.—The Northeastern United States, from Maine to Pennsylvania (inclusive); westward to Ohio.

Habits.—The Wood Terrapin is not aquatic in habits, although it usually frequents damp places and can swim readily. It prowls in damp woods and swamps, feeding upon tender vegetation, berries and insects. In the spring it is usually found about streams and at that time is often seen in the water.

Captive specimens are fond of berries and lettuce. They will also devour chopped fish and the larvæ of beetles, coming to the hand that feeds them and taking food from the fingers.

CHAPTER VI: THE BOX TURTLES

GENERA *EMYS* AND *CISTUDO*

Turtles with Divided, Hinged Plastrons—Descriptions of the Species—Their Habits.

IN the consideration of the genera *Emys* and *Cistudo*, the student has passed, in the classification of the Chelonia, the strictly aquatic species, and is referred to the connecting links between the former and the true tortoises—terrestrial reptiles, of *Testudo* and allied genera. The structure and habits of the species of the present chapter afford admirable examples of transition, in the scale of evolution.

The Box Turtles derive their popular name from the structure of the plastron, which is attached to the carapace by an elastic, cartilaginous joint. The plastron is divided by a central hinge, which permits both the front and rear portions to be drawn against the lower surface of the carapace. Thus, in time of danger, the creature draws in the head and limbs and closes the shell in box-like fashion.

The genus *Emys* is composed of but two species, one of which inhabits Europe and Asia and is very aquatic in habits. The other species, Blanding's Turtle, occurs in the United States, and although possessing fully webbed feet and being partial to the neighborhood of water, is given to the habit of wandering over swampy areas. The genus *Cistudo* is composed of five* North American species that are strictly terrestrial although several of these species display distinct traces of webs between the toes, while others have feet like the true tortoises. Thus we trace our way along the links of the chain, and can understand why the species of *Cistudo*, although quite terrestrial, cannot properly be termed tortoises, as their structure demonstrates that they are more closely allied to the turtles.

* A sixth species occurs in Mexico—*C. mexicana*. It has three claws on the hind foot.

The Box Turtles

Following is a key to aid in the identification of the North American Box Turtles:

- I. Feet fully webbed. Carapace elongated and globular.
Genus *Emys*.

Black, with numerous yellow dots.

BLANDING'S TURTLE, "SEMI-BOX" TURTLE, *E. blandingii*.

Distribution.—Central States; eastward to New England States.

- II. Feet club-shaped, or sparsely webbed. Carapace short and globular.
Genus *Cistudo*.

- a. *Hind foot with four claws*.

Carapace without a keel. Brown or black with yellow, radiating spots.

PAINTED BOX TURTLE, *C. ornata*.

Distribution.—Central States to the Rockies; south into Mexico.

Carapace with a keel. Brown or black with irregular, yellow spots.

COMMON BOX TURTLE, *C. carolina*.

Distribution.—Eastern United States, north of Georgia.

Carapace with a keel.* Brown or black, with yellow, radiating lines.

LARGE BOX TURTLE, *C. major*.

Distribution.—Georgia to the Rio Grande.

- b. *Hind foot with three claws*.

Carapace like two preceding species.

Olive, with obscure yellow markings.

THREE-TOED BOX TURTLE, *C. triunguis*.

Distribution.—Georgia to the Rio Grande; northward to Missouri.

Carapace very high and globular—keeled.

Brown or black, with greenish, radiating lines.

BAUR'S BOX TURTLE, *C. bauri*.

Distribution.—Southern Georgia and Florida.

The "Semi-box" Turtles—Genus *Emys*: The two species of this genus are characterised by a rather long, globular shell. The plastron is attached to the upper shell by a cartilaginous joint. It is divided by a central hinge and both the front and rear portions are movable—the former to a considerable degree and the latter but slightly so; thus the popular title, "semi-box" turtles.

The species of *Emys* are aquatic, living about ponds and rivers, where they bask upon derelict timber and plunge into

* The largest species of the genus.

The Box Turtles

the water at the slightest alarm. Their feet are broadly webbed. Although the two species of this genus are widely separated in distribution—one occurring over a vast area comprising Europe, Asia and northern Africa, and the other inhabiting the central and eastern portions of the United States, they are remarkably similar in structure and colouration, though the Old World species is considerably the smaller. It is the common Pond Turtle of Europe, *Emys lutaria (obicularis)*.

A description of the North American species is given:

BLANDING'S TURTLE; THE "SEMI-BOX" TURTLE

Emys blandingii, (Holbrook)

The shape of the upper shell is higher (globular) and longer than with the other water turtles. Except with very young specimens the shell is smooth. The general structure of the plastron is much like that of the typical box turtles, although the rear half closes but partially and is bluntly notched. Both front and hind feet are broadly webbed, as with the typical pond turtles. The head is cylindrical, with sharply notched upper mandible, and the neck is very long.

Colouration.—Upper shell black, with numerous pale yellow or whitish spots. The plastron is yellow in the centre, with large black blotches about the pale area.

Above, the head is black, with many yellow dots. The chin and throat are bright, immaculate yellow.

Dimensions.—Following are the measurements of a mature specimen, from North Judson, Indiana:

Length of Carapace	7 $\frac{1}{8}$ inches
Width " "	5 "
Length of Plastron	7 $\frac{1}{2}$ "
Length of Front Lobe	3 $\frac{1}{4}$ "
Width at Hinge	4 "
Height of Combined Shell	2 $\frac{1}{8}$ "

Distribution.—Blanding's Turtle appears to attain a centre of abundance in Indiana, thence it occurs in lesser numbers in Illinois, Wisconsin, Michigan, Ohio and on the north shores of the Great Lakes in Canada. Eastward of the Central States it is a comparatively rare species though the range extends into the Alleghanean region and northeastward through Pennsylvania and New York, into Massachusetts, Rhode Island and

The Box Turtles

New Hampshire. The species does not occur near the coast regions of New York, Connecticut or New Jersey.

Habits.—Although fully as agile in the water—in swimming, diving and remaining a considerable time beneath the surface—as the typical pond and river turtles and terrapin, this species often evinces a desire to wander about on land, and while it seldom ventures from wet, marshy areas, prowls about through the undergrowth in search of tender shoots, berries and insect larvæ, a character quite in opposition to the feeding habits of the strictly aquatic turtles and terrapins, which are unable to feed unless under water. Blanding's Turtle feeds with equal readiness upon the ground, or under water. Captive specimens are very fond of lettuce; they also feed voraciously upon earthworms, small fishes, tadpoles and young frogs, actively pursuing these creature in the water and seizing them by a sudden dart of the head. Well fattened specimens are unable to employ the hinged plastron to but a slight extent and with such individuals the rear lobe is quite useless in covering the hind limbs which bulge from the shell in helpless fashion.

The species is very timid and if handled will withdraw the head and front limbs within the shell, close the front lobe of the plastron and remain in this position for an indefinite period—frequently for several hours. On one occasion the writer procured several hundred specimens with which he stocked a small pond. Floating in this pond were several logs and upon these the turtles were in the habit of crawling in rows and clusters, for a sun bath. The slightest alarm would cause them to plunge in a volley into the water, from which, a few minutes later, their heads would be protruded in a fashion that caused the pond to look as if it were infested with water snakes—the turtles' shells being invisible.

The Box Turtles—Genus *Cistudo*: The six alleged species of this genus are so closely related that further investigations of more elaborate series of specimens than are now possessed by our museums, will probably result in the contraction of the genus to but three or four species, and several varieties or subspecies. Although some of the forms possess four claws on the hind foot and others have but three claws, this structural difference does not appear to be of great importance, for more pronounced characters cause the species to arrange themselves

The Box Turtles

in technical classification so that the four-clawed and three-clawed forms alternate in the list. Of the series, the Painted Box Turtle, (*C. ornata*), is a perfectly distinct species, as the shell is quite flat in the area of the central shields and there is no trace of a keel. It is very probable that the Three-toed Box Turtle (*C. triunguis*) will be found to be but a variety of the common species, *C. carolina*, which possesses four claws on the hind foot, and that Baur's Box Turtle (*C. bauri*), another three-toed form, may be decided to constitute a variety of the Large Box Turtle (*C. major*), which also possesses four claws. The Mexican species, *C. mexicana*, may also be but a Southern form of the *C. major*.

To set forth the characters of the Box Turtles and popularise the descriptions, the writer provisionally describes the five North American forms as species, arranging them as in the key in an effort to facilitate the work of the less advanced student.

THE PAINTED BOX TURTLE

Cistudo ornata, (Agassiz)

The form of the carapace is broad and globular. It is distinctly flattened on the area of the central row of plates, *and is without a trace of the pronounced keel of the other species*. There are four claws on the hind feet.

Colouration.—The shell is dark brown or black above, with moderately broad, yellow, radiating lines. The lower shell is brightly coloured, being yellow, but so thickly suffused with brown that it presents an intricate network of yellow and brown bands.

The head is dark, with large yellowish or reddish spots upon the sides and dots of the same colour upon the top, while the neck is banded with the same bright hue.

With most specimens the scales of the forelimbs are bright red—with some, orange.

From its generally bright colouration, this is the most attractive species of the box turtles.

Dimensions.—Height of Combined Shell $2\frac{1}{2}$ inches
Length of Carapace $4\frac{1}{2}$ "
Width of " $3\frac{1}{2}$ "
Length of Plastron $4\frac{1}{2}$ "
Width of Head 1 "

The Box Turtles

Distribution.—Indiana to the Rocky Mountains and southward into Mexico. In the Southern United States, the species does not range eastward of Texas.

THE COMMON BOX TURTLE

Cistudo carolina, (Linn.)

The carapace of this species is highly arched and globular, with a distinct, though blunt keel upon the centre. The front and rear borders of the upper shell flare outward and the edges curl upward. There are four claws upon the hind feet.

Colouration.—Black or dark brown above, with numerous yellow spots or blotches. The *markings are extremely variable*. They may consist of short, yellow bands arranged in irregular groups in each plate, or of bands that run together on the sides of the shell, forming broad, E-like markings. On many specimens the markings are confined to the centres of the shields, each of which contains an irregular blotch that resembles the outline of a large drop of fluid falling upon a flat surface and splashing in every direction. Occasional specimens look as if they had been spotted with a brush, with no regard for regularity in the placing of the blotches.

The plastron is yet more variable than the carapace. On some specimens it is of a uniform dark brown or black; on others black, with large patches of yellow. A specimen in the writer's collection possesses a plastron strikingly marked with narrow lines and spots of black and yellow over the entire surface. The black markings fuse into the yellow through a medium of rich brown and the effect is to closely resemble the showy markings of the Hawk's-bill Turtle, which yields the valuable "tortoise" shell.

The head markings of this species are very irregular. Male specimens usually have bright red eyes; the eyes of the females are generally yellow.

Dimensions.—The measurements in this list are of an adult, male specimen:

Height of Combined Shell	2½ inches
Length of Carapace	5½ "
Width of "	4½ "
Length of Plastron (open)	5½ "
Width of Head	1½ "

The Box Turtles

Distribution.—The New England States, to South Carolina (inclusive) and westward to Kansas.

Habits of the Box Turtle

There is no reptile possessing greater immunity from harm than the Box Turtle. Once its shelly fortress is closed there are few living creatures except man that can harm the fleshy parts within. Other chelonians, although withdrawing the head and limbs within the shell at times or danger, are in much the same predicament when discovered by a hungry animal as the proverbial ostrich that buries its head in the sand to "conceal" itself from harm. Sharp claws, mounted on sinuous limbs, or the talons of the birds of prey can readily tear the exposed fleshy parts of the ordinary turtle from its shell.

Though the Box Turtle closes its shell in a manner to appropriately elicit the creature's popular name—and effectually protect the reptile from harm, individuals vary as regards the perfect closing of the hinged portions of the plastron against the upper shell. The writer has examined specimens with which the lobes of the plastron closed so perfectly against the carapace that at no part of the union of upper and lower shell was there sufficient space to insert such a small object as a broom straw. Indeed, it does not appear possible that such specimens could breathe without difficulty, for they usually remain tightly closed for an hour or more—or as long as there is the slightest suspicion of danger. Other specimens close less perfectly, so that it is possible to insert a good-sized quill in several places around the plastron, while there are occasional specimens with which the plates at the extremities of the plastron protrude slightly from the border of the upper shell and thus prevent a good union—sometimes to such an extent that the limbs may be seen through an orifice of about an eighth of an inch.

The muscles that close the plastron are of great power. It is by no means an easy matter to pry the shells apart, even though one have strong hands and be provided with an implement of such leverage as a chisel. Some specimens are so fat from voracious feeding during the berry season that they are unable to close both lobes of the plastron simultaneously—the pressure of one-half of the lower shell upon the fleshy parts ludicrously forcing open the other.

The Box Turtles

The Box Turtle is a strictly terrestrial reptile and its habits tally closely with those of the true tortoises, although it is of a wandering disposition and does not dig permanent burrows. It is most abundant in situations where open, grassy spots alternate in sparse thickets. The food consists largely of vegetable matter and berries, though the larvæ of insects are eaten as well as earthworms and slugs. During the periods when blackberries ripen many specimens show unmistakable evidences of feasting by their stained mandibles and forefeet.

Like other terrestrial chelonians, the Box Turtle lives to a great age. It is difficult to explain the exact duration of life of this species, but examples have thrived for ten or fifteen years in captivity, that were old and worn quite smooth when captured.

A curious and interesting specimen was found several years from the time of writing, in Virginia. The writer had been roaming over the beautiful farmlands that once constituted the battlefields of Bull Run and Groveton. He had stopped to examine a noble tree, gnarled in many places from the old wounds of a heavy shell-fire. The tree stood on a knoll near Groveton and had been in the centre of a shower of lead and iron hail during the stormy days of war. On two occasions had the opposing armies swept over this pretty country to the tune of cannon and musketry and many trees beside the one that had particularly engaged the writer's attention, showed battle scars.

These few descriptive words are in strict accordance with a turtle that drew the writer's attention, as it emitted a sudden hiss and closed its shell tightly at his approach. It was a very old specimen, with a dull, lustreless shell. Across its back was a deep furrow, healed by many years. So deeply did this penetrate into the creature's shell that the original injury must have penetrated to the very edge of the reptile's vitals, yet a wonderful tenacity of life and great reconstructive power had permitted the turtle to so heal the wound as to partially cover the deep tear with a rough, bony growth. Along the edges of the shell were other indentations, which had healed in the same manner. Who can dispute the very plausible theory, that nearly forty years before, during a human exchange of metal animosities, this reptile was struck by a flying minie ball that tore the furrow

The Box Turtles

and, by the force of its impact, sent the creature tumbling over the stony ground to produce the deep scars about the edge of the shell. If such were the case, the reptile being full-grown when the injury was inflicted—the severe nature of the wound would stunt all subsequent growth—it had lived many years to attain its size, then possessed the tenacity to recover from the wound and afterward continued to live for nearly forty years after. It may interest the reader to know that this turtle is, at the time of writing, thriving in captivity.

The eggs of the Box Turtle are ovoidal in shape and covered with a thin, but hard shell. They are buried in soft ground, or secreted under leaves. It is an interesting, but curious fact, that the very young specimens are very rarely found.

When retiring for the winter, this turtle burrows to some depth in soft ground. This was well illustrated by the experience of a friend of the writer, who was engaged in the melancholy duty of digging a grave for a large, pet dog. The animal had died in January and a severe frost had hardened the ground for a distance of five inches. After breaking through this it was easy digging and as the gentleman had reached a depth of about two feet he unearthed a Box Turtle, which showed feeble signs of life.

THE LARGE BOX TURTLE

Cistudo major, (Agassiz)

The name of this species is quite appropriate. It attains the greatest size of any of the box turtles—growing to a length of seven inches. The carapace is high and globular and flares out distinctly on the rear margin. There is a blunt keel in the centre. As this species has four claws on the hind foot, it may be readily distinguished from Baur's Box Turtle, into the range of which it enters in the east.

Colouration.—The carapace is dark brown, with yellow spots arranged in radiating fashion, while there is a yellow band on the keel. The greater part of the plastron is yellow, although the edges of the shields are tinged with black. On the head is a considerable amount of yellow markings.

Distribution.—Florida and Georgia, westward to the Rio Grande.



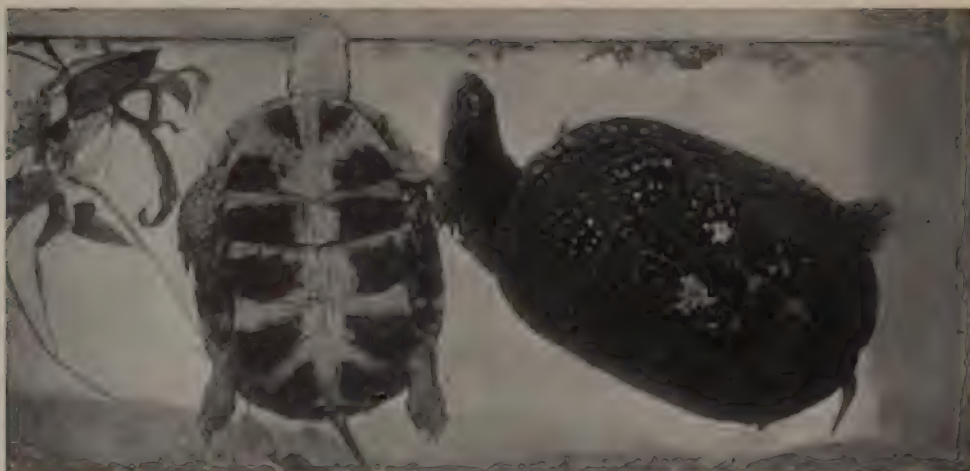
SPOTTED TURTLE, *Chelopus guttatus*

One of the most abundant species of the Eastern States. Has a habit of roosting on logs and tussocks, and plunging into the water upon the least disturbance. The shell of an adult is about 4 inches long



MUHLENBERG'S TURTLE, *Chelopus muhlenbergii*

Confined to southern New York, New Jersey, and eastern Pennsylvania. The vivid orange patch on each side of the head is characteristic



BLANDING'S TURTLE; SEMI-BOX TURTLE, *Emys blandingii*
The plastron has a central hinge, but only the front lobe can be perfectly closed



PAINTED BOX TURTLE, *Cistudo ornata*
A typical representative of its genus. The plastron has a central hinge. Both lobes close tightly in time of danger
This species ranges from the Mississippi Valley to the Rockies



COMMON BOX TURTLE, *Cistudo carolina*
Inhabits the Eastern States. Note the specimen on the left having the lobes of the plastron completely closed

THE THREE-TOED BOX TURTLE

Cistudo triunguis, (Agassiz)

In the general form of the carapace, this species is precisely like the Common Box Turtle, from which it differs in possessing *but three* claws on the hind foot, and the extreme narrowness of that extremity.

Colouration.—The colouration of the upper shell of the majority of specimens is dull olive, with obscure, yellowish markings. Some specimens are darker and show yellow markings that appeal strongly to *C. carolina*. The head is generally brownish, with but obscure markings.

Distribution.—Georgia and Florida westward to the Rio Grande; in the Mississippi Valley this species extends northward into Missouri.

BAUR'S BOX TURTLE; FLORIDA BOX TURTLE

Cistudo bauri, (Taylor)

Like the preceding species, this box turtle is characterised by three claws on the hind foot. The shell is very high and narrow—considerably more globular than that of the preceding species. There is a distinct keel on the central portion of the carapace, and but a slight tendency to flare upwards on the rear margin.

Colouration.—In its general colouration, this turtle appears to be quite distinct. The carapace is dark brown, with many narrow, greenish, or greenish-yellow radiating lines. With the greater number of specimens the plastron is immaculate, greenish-yellow.

The head markings are fairly constant and distinct. Male specimens have the head dark brown or black, with the exception of the mandibles, which are yellowish, and an indistinct band, extending from behind the eye to the neck. This pale shade on the mandibles is frequently absent from female specimens, although the throat is speckled with a pale hue and several indistinct and broken bands appear on the head. The young are strongly marked, having vivid, sharply delineated, radiating lines. Combine these markings with an extremely high carapace and the make-up is markedly grotesque.

The Box Turtles

Dimensions.—The measurements given are of a specimen taken in Marion County, Florida:

Height of Combined Shell	2 $\frac{3}{4}$	inches
Length of Carapace	5 $\frac{1}{2}$	"
Width of "	3 $\frac{3}{4}$	"
Length of Plastron, open	5 $\frac{1}{4}$	"
Width of Head	1 $\frac{1}{8}$	"

Distribution.—Southern Georgia and Florida.

Habits.—This box turtle frequents the pine barrens. In habits it resembles the common species. Captive specimens are very hardy and live for indefinite periods.

THREE-TOED BOX TURTLE, *Cistudo triangulis*

Closely allied to *C. carolina*, from which it differs in having only three claws on the hind foot. Markings on the shell are usually obscure

BAUR'S BOX TURTLE, *Cistudo bauri*

Confined to Georgia and Florida where it inhabits the dry pine woods. The close-set, radiating bands on the upper shell are distinctly greenish



GOPHER TORTOISE, *Gopherus polyphemus*.
Found in the barren, sandy areas of the Southern States. It digs a long burrow where it retires during stormy weather.

CHAPTER VII: THE TORTOISES

*Strictly Terrestrial Chelonians. Represented in North America by
Three Species*

THE greater number of the true Tortoises inhabit the Old World. They comprise four very closely allied genera. The largest genus is *Testudo*, which is made up of about thirty-eight species. All of the New World species belong to this genus. Three occur in North America proper (in the extreme southern portions of the United States); three inhabit Mexico, Central America and northern South America, and a number are confined to the Galapagos Islands. The latter are huge tortoises, whose generations are supposed to have survived the Age of Giant Reptiles.

The Tortoises are easily distinguished from the turtles, by the club-shaped feet of the former, in place of the webbed feet of the latter, and the high, dome-like shell. The skin is dry and wrinkled. Their method of placing the hind feet, when walking, and the peculiar formation of these appendages, at once suggest (in miniature) the feet of an elephant.

All of the Tortoises are strictly terrestrial and if forcibly thrown into water, are clumsy and almost helpless. A large number of species frequent arid situations—some, the deserts proper. Many dig deep burrows, in which they retire during the great heat of mid-day. The larger part of the food of these creatures consists of vegetation and fruit.

The three species of Tortoises inhabiting the United States are remarkably similar in colouration, all being of a dull, brown hue. They evince similar habits in selecting dry, barren areas, and digging long burrows in which to shelter. A key to assist in their identification is given:

- A. Shell much longer than wide.
Some greatly enlarged scales on inner surface of fore-arm. Front lobe of plastron bent abruptly upward.
GOPHER TORTOISE, *Testudo polyphemus*.

The Tortoises

Distribution.—South Carolina to Florida; westward to western Texas.

No enlarged scales on inner surface of forearm.

Front lobe of plastron but slightly directed upward.

AGASSIZ'S TORTOISE, *Testudo agassizi*.

Distribution.—Deserts of Arizona and southern California.

B. Shell nearly as wide as long.

Front lobe of plastron nearly straight.

BERLANDIER'S TORTOISE, *Testudo berlandieri*.

Distribution.—Southern Texas and northeastern Mexico.

Detailed descriptions of these species follow:

THE GOPHER TORTOISE

Testudo polyphemus, (Daudin)

Size large. Shell rather high, but flattened on the top; bluntly rounded at front and rear. Upper surface quite smooth with old individuals, but showing many sharp, concentric grooves in the shields of young specimens. The head is blunt and rounded; the tail is very short. The plastron is thick and heavy, the rear portion notched, the front projecting beyond the edge of the carapace in the shape of a thick and narrow process, which is bent sharply upward, owing to the upward slant of the front lobe of the plastron.

The front portions of the forelimbs are covered with large and thick scaly plates. The terminal joint of the limb is flat and along the margin are very large, horn-like scales; at the bend of the limb there is one of these spines considerably more developed than the others; it is usually attended by several spines irregularly larger than those of the marginal row. The hind limbs are covered with a finer scalation and resemble, in miniature, the feet of an elephant. All four feet possess very stout, blunt claws. The general make-up is as strongly suggestive of a terrestrial life, as that of a flat-shelled, web-footed turtle points toward an aquatic existence.

Colouration.—The shell of the adult specimen is dull brown, perfectly uniform in colour with those individuals that possess smoothly-worn shells, but with obscure, dull yellow blotches in the centres of the shields (one in each shield) on younger specimens. These blotches may be intensified by moistening

The Tortoises

the carapace. They are pronounced on very young specimens. The plastron is uniform, dull yellow. The skin of the limbs is a dull brown or gray; that of the head is darker. The eyes are dark and bead-like.

Dimensions.—The measurements given are of an adult, female specimen, from Marion County, Florida:

Length of Carapace	11½ inches
Width of	8 "
Length of Plastron	11½ "
Width of	7½ "
Width of Forearm	2 "
Width of Head	2 "

The weight of a specimen showing the preceding dimensions—these representing one of fairly large size—would be about nine pounds. From the measurements, it will be seen that the length of the shell is considerably in excess of the width. This character is important in distinguishing the species from Berlandier's Tortoise, which extends into the former's *habitat*, in the western portion.

Distribution.—South Carolina to Florida (including both states) and westward into western Texas.

Habits.—In this reptile we have a typical example of the true tortoise—a terrestrial, slow-going, herbivorous, and, in proportion to its size, wonderfully strong creature. While lacking in agility as compared with the turtles, the Tortoises exhibit considerably more intelligence than the former.

The Gopher Tortoise is most abundant in dry, sandy areas, where it burrows long tunnels in which to retreat. The writer made several trips into areas frequented by these reptiles. One region in particular, he well remembers. It was a great, barren stretch of sandy country in Hampton County, South Carolina. This region was known as the "sand hills" and was quite useless for agricultural purposes. Over this gently undulating waste was scattered a sparse growth of scrub oak, wire grass, and isolated, stunted weeds. During the middle of the day, the heat upon this miniature desert was almost unendurable for a man. At such times the Tortoises were usually secreted in their burrows. They were found prowling during the very early morning, or on cloudy days. Their burrows were quite numerous. Eight

The Tortoises

or ten would frequently be counted within a radius of one hundred feet.

The location of a burrow is easily noted by the mound of sand that has been thrown to the surface. From the height and diameter of this mound, the depth of the burrow may be estimated. On these "sand hills," but three or four inches of the surface is dry and shifting; beneath this slight depth, the sand is damp and well packed. Through the damp strata, the Tortoise extends its burrow in a gentle slope from the surface, and, curiously enough, in the exact shape of a transverse section of the creature's shell.

The footprints of the Tortoises are readily followed, and by this method a number of specimens were captured. If a Tortoise has not emerged from its burrow since the night preceding, the fact is made evident by ambitious spiders, which daily spin their webs over the mouths of the shafts. Several of the burrows were measured by running a slender pole into their depth, and were found to extend, in a gently sloping downward direction, for a distance of fourteen feet and over. Recently, investigations have been made of the homes of these creatures and energetic digging was rewarded with results at least interesting to the entomologist, for several species of beetles, belonging to a family popularly known as "rolling beetles," or "tumble bugs" were found living upon the excreta of the tortoises, and, strange to explain, these beetles proved to be a species entirely new to science. It has since been demonstrated that they inhabit only the burrows of this species of tortoise.

In captivity the Gopher Tortoise is hardy and thrives for an indefinite number of years if given the proper care. Captive specimens are fond of such tender vegetables as lettuce and celery; they take all kinds of fruit voraciously and will also eat raw meat. They soon learn to recognise the one who feeds them and take dainty morsels from the fingers without signs of fear. Considerable warmth, and absolutely dry quarters are the most important factors in keeping these reptiles in good health. Without sufficient warmth (from 75 to 85 degrees Fahr.) they will not feed, and the least bit of dampness brings on symptoms that resemble an ordinary cold, when they gradually become weak and die. They display little inclination to burrow and hide, in captivity.



DESERT TORTOISE, *Testudo agassizii*
Inhabits the deserts of the southwestern United States



PLASTRON OF THE DESERT TORTOISE, *Testudo agassizii*



BERLANDIER'S TORTOISE. *Testudo berlandieri*
Owing to its short and broad shell—the length and breadth being very similar—this species is unique among the tortoises.



PLASTRON OF BERLANDIER'S TORTOISE. *Testudo berlandieri*

This reptile buries its eggs in the sand in a situation exposed to the full rays of the sun. During the breeding season, the males utter a short, rasping call, repeated at intervals of about two seconds apart.

AGASSIZ'S TORTOISE

Testudo agassizi, (Cooper)

In general outlines, size and in colouration, this species is very similar to the preceding. The enlarged scales or spines on the forearm that are so noticeable with the preceding tortoise, are absent from this species, the scales of the forearm being large and coarse, but of fairly uniform size. The head is narrower and the front lobe of the plastron slopes but gradually upward in place of the abrupt, upward inclination to be noted with the Gopher Tortoise.

Dimensions.—The measurements of a fair-sized specimen from the desert south of Phoenix, Arizona, are given:

Length of Carapace	9½ inches
Width of	7 "
Height of	4½ "
Length of Plastron	9½ "
Width of	6 "
Width of Head	1½ "
Width of Forearm	1½ "

These measurements show much the same conformation as the preceding species—the considerably greater length over the width of the shell. By this character, the two species considered differ from Berlandier's Tortoise.

Distribution.—Deserts of Arizona and southern California.

Habits.—The writer's specimens have exhibited considerable intelligence, becoming exceedingly tame within a few days after their arrival from the deserts. They learn to take food from the hand and appear to possess actual affection. Two specimens, at the time of writing, have the liberty of the writer's room. They insist upon crawling over and about his feet and when desiring to rest, often crawl under his chair. where they stretch their limbs backwards, in alligator-like fashion, outstretch the head and neck to the fullest extent, when their dark, beady eyes peer about curiously without an intimation of fear. They have regular trails about the floor, which they follow for

The Tortoises

hours, seldom deviating an inch, this way or the other from imaginary lines, though daily, they appear to change the routine of their marching. On one day the larger specimen traversed the centre of the room in circular fashion. In the centre of the circle, which measured about eight feet in diameter, was a small table. Around this object the tireless reptile continued its seemingly aimless journey for hours, its bluntly-clawed feet clicking regularly upon the hard-wood floor. On another occasion the writer dropped a small book and neglecting to immediately pick it up, was attracted to it a moment later by hearing one of the tortoises crawl over it. A minute later, the tortoise recrossed the book. When a third time the writer's attention was called to this sound, he watched the creature. It had changed its previous line of march to a straight course, up and down the room, which trail led directly over the book—and this was clambered over with some effort. Fourteen times the eccentric reptile stepped the length of the room in a straight path, turned deliberately at each end and on its return clambered over the book, which lay in a well cleared area. The book was removed and developments awaited. When the tortoise returned and reached the spot where the book had been, it paused in what appeared to be deep thought, then continued as before and for half an hour longer marched up and down, when it returned to its favourite corner (near the heater) to sleep.

What reason the reptile has for these peculiar promenades, the writer is unable to guess. Certain it is that these creatures pace over certain areas with the regularity and persistence of caged cat animals.

Like the other species of tortoises inhabiting the United States, this reptile walks upon the claws only, of the front feet, while the hind feet are planted flat, exactly like the feet of an elephant. It is by no means sluggish in its actions, but its activity depends upon warmth. In a temperature of from 85 to 95 degrees Fahr., it can get over the ground as fast as a man at a slow walk. Unless kept very warm *and dry*, it never displays such vivacity. If these desert creatures be placed in damp quarters, though the temperature be high, they cease feeding and die within a few weeks. The writer's specimens are very fond of lettuce, celery, berries and bananas. They also eat clover and begin by picking out the blossoms.

BERLANDIER'S TORTOISE

Testudo berlandieri, (Agassiz)

This species is very distinct from the two preceding ones, owing to its very broad and high carapace, which produces a very globular aspect. While the upper jaw of the two former species is *notched*, this tortoise has a *hook* on the upper mandible.

The shell is nearly as broad as long and is proportionately high and globular. Compared with the preceding species the forelimbs are narrower and the head smaller. The front lobe of the plastron, which in front extends beyond the margin of the upper shell, terminates in a narrower, deeply notched process and is but slightly directed upward.

Colouration.—Dull brown, the centres of the shields yellowish though this character becomes obscure with age. The plastron is dull yellow. The fleshy parts of this tortoise, particularly the hind limbs, are paler than with the two preceding species.

Dimensions.—The measurements are of a rather small specimen, from Brownsville, Texas:

Length of Carapace	6 inches.
Width of " "	5 $\frac{3}{4}$ "
Height of " "	3 $\frac{1}{4}$ "
Length of Plastron	6 $\frac{1}{4}$ "
Width of Plastron	4 $\frac{3}{4}$ "
Width of Forearm	7 $\frac{1}{8}$ "
Width of Head	1 $\frac{1}{4}$ "

Distribution.—Southern Texas and northeastern Mexico.

Habits.—Much like the preceding species.

As the writer looks back upon his general experience with living reptiles of all the orders, he considers the various species of tortoises that have come under his observation to have displayed the most marked symptoms of intelligence. Among all reptiles they are the most docile, and even with the huge species from the Galapagos Islands and their allies from the Aldabra Islands, which creatures have power enough in their great jaws to sever a man's hand at the wrist, we find the same docility, combined with an intellect that approaches the mental capacity of warm-blooded creatures.

CHAPTER VIII: THE SOFT-SHELLED TURTLES

GENUS TRIONYX

Strongly Characteristic Chelonians, with a Soft, Leathery Shell

Classification.—The family *Trionychidæ* is composed of about twenty-seven species embraced within six genera. A few species inhabit North America; the majority occur in southern Asia and the East Indies; several species inhabit Africa. The largest genus is *Trionyx*. All of the North American species belong to this genus; the other species inhabit both Asia and Africa.

Structure.—From all of the other chelonians the Soft-shelled Turtles are strikingly distinct. The shell is exceedingly flat and in its outline is either bluntly oval or almost circular. Lacking the hard shields of other turtles, the carapace and the plastron are soft and leathery: the former bends freely at the edges, and droops, like a flap, over the orifice through which the head and neck are withdrawn in time of danger.

The neck of the Soft-shelled Turtle is very long, the head is narrow and *the snout is provided with a slender proboscis*, at once imparting a characteristic aspect. While the general appearance of these creatures is fleshy and inoffensive, and the jaws are provided with lip-like folds of skin, the latter cover powerful and keen-edged mandibles and these reptiles bite with the energy of the snapping turtles. The head and neck are completely retractile. As the species are very aquatic, the feet are broad and extensively webbed.

General Habits.—All of the Soft-shelled Turtles inhabit rivers, ponds and lakes with a soft, muddy bottom. They seldom or never leave the water unless to deposit their eggs—a short distance above the waterside. These reptiles frequently take the hooks of fishermen. They are uniformly agile and vicious; large individuals are dangerous.

In the areas inhabited by these turtles in the United States, they are commonly called the “flap-jack tur-

The Soft-shelled Turtles

bles." The title is a harsh one, but it conveys the right impression of their structure, as removed from the water they present a ludicrous impression of large and animated pancakes. Their progress under such conditions is clumsy and the soft plastron becomes bruised and lacerated on a hard, rough surface.

A key to the North American species is given:*

A. *Front margin of carapace with conical tubercles.*

Carapace brown or olive, with dull blotches or black rings. *Two pale bands on head, forking a short distance in front of eyes.*

SOUTHERN SOFT-SHELLED TURTLE, *T. ferox*.

Distribution.—Georgia to Florida; westward to Louisiana.

Carapace olive, with numerous black rings.

Two pale bands on head, forking at base of proboscis.

SPINY SOFT-SHELLED TURTLE, *T. spinifer*.

Distribution.—Central and northern tributaries of the Mississippi and St. Lawrence Rivers.

B. *Front margin of carapace smooth.*

Carapace brown or olive, unicolour or with obscure, line-like blotches. Head markings obscure, but forking at base of proboscis.

BROWN SOFT-SHELLED TURTLE, *T. muticus*.

Distribution.—Similar to *T. spinifer*.

Carapace olive, usually with numerous black dots.

Head bands uniting a short distance in front of eyes.

EMORY'S SOFT-SHELLED TURTLE, *T. emoryi*.

Distribution.—Tributaries of the Rio Grande River.

The markings on the carapace are usually lacking on old individuals of all the species.

The descriptions of these turtles, when dealing with structural characters alone are difficult problems for the beginner. The colouration of the carapace cannot be relied upon owing to the fading of the markings on old specimens, as explained,

* Two alleged species are excluded. These are *Trionyx asper* and *T. nuchalis*, both of Agassiz. The range of the former has been given as "The Mississippi"—the latter as occurring in the Cumberland and the Tennessee Rivers. The writer has been unable to examine specimens of either and is not convinced as to their standing as full species. Both appear to be related to *T. mutica*.

The Soft-shelled Turtles

but the head markings are important. As but four species are to be described, and these may be separated, as seen by the key, into two groups, according to the structure of the carapace, the descriptions may be concise, and identifications should be made readily.

THE SOUTHERN SOFT-SHELLED TURTLE

Trionyx ferox, (Schweigger)

Largest of the North American species; attains a length (of shell) of 18 inches and a weight of about 30 pounds. The carapace is not much longer than broad; *on the front margin is a row of conical tubercles*; these are but little developed on young specimens. When the animal is out of the water, the edges of the carapace droop about it. The central portions are much harder, as the skeleton—the ribs and vertebræ, lies close to the surface; the outlines of these bones may be detected on very old or thin examples. The tail is very thick and moderately long, with the vent situated near the tip. When the head and front limbs are withdrawn, the forward, thin flap of the carapace, closes against the plastron; the hind limbs are unprotected.

Colouration.—Perfectly adult specimens have a uniform, dull brown carapace. The head is brown, with very indistinct pale bands, but these may be seen to join immediately in front of the eyes. The plastron is immaculate white.

Specimens not fully grown have an olive or pale brown carapace, marked with dull, black spots, or dots, disposed in rings. On each side of the head and neck is a yellowish band; this extends forward through the eye, and unites with its fellow on the top of the head a short distance in front of the eyes. The character evinced by these bands is important in distinguishing the species from the Spiny Soft-shelled Turtle, on the top of the head of which, the bands unite way forward—at the base of the proboscis.

Very young specimens are gaily coloured.

Dimensions.—The writer's largest specimen had a carapace 18 inches long and 15½ inches wide. It weighed 29 pounds, and was captured in an inlet of the Indian River, Florida.

Distribution.—Georgia and southward throughout Florida; westward through Louisiana—in rivers and ponds with a muddy bottom; often in brackish water. The species is edible and

The Soft-shelled Turtles

sold in considerable quantities in the markets of both the South and the North.

Habits of the Soft-shelled Turtle

Old logs, protruding a moist and slimy surface a few inches from the water, sometimes tempt these creatures from the element for which they are specially provided. In such situations they lie taking a sun-bath, with limbs withdrawn beneath their flabby "shells" and their long necks stretched to the fullest extent, imparting the idea of as many snakes, emerging from under flat stones. At the least alarm they scramble frantically for the water, but upon reaching it their clumsy movements are instantly transformed. Against the resisting surface, the broad, fin-like feet take great purchase and the frightened reptiles disappear with almost the agility of a scurrying school of fishes.

While displaying the same habits as most reptiles—the flight for shelter if the coast be clear—the soft-shelled turtle at bay is one of the most vicious of cold-blooded creatures; moreover, the knife-like edges of the jaws of large individuals are formidable weapons, capable of badly lacerating a man's fingers, or possibly severing a finger if seized at the joint. The soft-shelled turtle darts at the offending object with the rapidity of the serpent's stroke. This vicious nature has elicited for the animal, in many parts of the South, the title of "soft-shelled snapping turtle." It frequently takes the hooks of the fishermen and in its frenzy to escape is always an object to prompt cautious manipulation.

The food of the soft-shelled turtle is varied. It is among the worst enemies of fish, frogs and even young fowl. Fresh-water mollusca are devoured in large quantities, particularly by the larger individuals.

During the early summer, the female leaves the water to seek a sandy spot exposed to the glare of the sun. Once a suitable place is found she scoops away the sand and burrows into it to the depth of three or four inches until she is completely covered and hidden, with the exception of a small opening through which she pokes her tubular snout. Here she remains for some days, until all the eggs have been deposited, usually

The Soft-shelled Turtles

to the number of several dozen, when she crawls from the burrow in a fashion that leaves the eggs covered and makes her way back to the water. The eggs are white and perfectly spherical; the shells are hard and brittle, but very thin. The diameter of an egg of average size is $1\frac{1}{8}$ inches, and looks much like the egg of the common snapping turtle (*Chelydra serpentina*). See illustration.

In captivity, the soft-shelled turtle will live for years, if provided with a deep tank and means of occasionally crawling from the water. The resting places should be perfectly smooth or the reptiles bruise the tender plastron causing sores to develop which ultimately result in the animal's death. Hence rock-work or concrete should not be used. Old, water-soaked logs or pieces of bark, fastened in such positions that they slope very gradually from the water, form the best resting places. The bottom of the tank should be covered, for three inches or more, with fine sand, as in this, the turtles will burrow and remain for some time beneath the surface. They should be fed chopped fish, or small minnows, raw beef and earthworms. It is always advisable to procure young, or half-grown specimens. They are not alone brighter in colouration, but appear more hardy.

As captives, the writer has had admirable opportunities of studying the species. Some large specimens—about fifteen inches in length of shell, were placed in a tank twenty feet long and eight feet wide. On one side of this capacious basin was a slanting runway, but during the several months that the turtles were kept here, they spent their entire time in the water, which was about five feet deep. When undisturbed their swimming movements were very deliberate and graceful, recalling the actions of the marine turtles. After crawling about the bottom of the tank for a time, a specimen would slowly rear itself upon the hind feet, and then, with a single sweep of the front limbs, rise to the surface, where it floated about with the slender tip of the snout protruding from the water. If alarmed, while in this position, all signs of grace disappear. Working the broad, paddle-like feet in alternation, he would dart through the water in lively fashion to seek a dark corner and there to hide. Every three days, each of these turtles was given a fair-sized shad. It was devoured by a series of clean-cut bites, the sharp jaws cutting the fish as readily as a cleaver.



EGGS OF TRIONYX SPINIFER.
Owing to their spherical form, the eggs are much like those of the snapping turtles.



HEAD OF TRIONYX SPINIFER.
The fleshy lips cover horn-edged and strong mandibles.



FRONT OF CARAPACE—SPINY SOFT-SHELLED TURTLE, *Trionyx spinifer*.
The spiny tubercles are only present on old specimens.



YOUNG OF THE SOUTHERN SOFT-SHELLED TURTLE, *Trionyx ferox*.
The bright markings on the shell disappear with age—in fact, after the creature is a year old.



SOUTHERN SOFT-SHELLED TURTLE, *Trionyx jersey*

In the rivers of Florida this species attains a weight of 30 pounds. A big specimen is dangerous to handle, as the head darts at an offending object with the quickness of a serpent's stroke



BROWN SOFT-SHELLED TURTLE, *Trionyx muticus*

Mature examples are uniform pale brown or olive, which has admirably matches the muddy river-bottom and aids the creature in obtaining its prey

THE SPINY SOFT-SHELLED TURTLE

Trionyx spinifer, (Lesson)

A smaller species than the preceding, but the general characters are very similar. The conical, spiny tubercles on the front margin of the carapace are very pronounced.

Colouration.—Dull olive, with a narrow yellow border, internally margined with black.* There are numerous black rings scattered over the carapace—a character vividly apparent on young specimens, which are green. The plastron is immaculate white.

Head markings.—The head is olive—not brown as with the preceding species. On each side of the head, and the neck, is a yellow, black-bordered stripe, extending forward and through the eye thence uniting with its fellow *at the base of the snout*. The head-markings alone will immediately separate the species from the Southern soft-shelled turtle. The limbs are olive, spotted and marbled with black.

Dimensions.—A mature, female specimen, taken at Quincy, Illinois, shows the following measurements:

Length of Carapace	14 inches
Width of "	12 "
Length of Plastron	10 "
Length of Tail	3½ "
Width of Head.	1½ "
Width of Spread, Hind Foot	3½ "
Weight	7½ lbs.

Distribution.—An abundant species in the Central States. It inhabits the tributaries of the Mississippi River in the states of Missouri, Iowa, Illinois, Wisconsin, Indiana, Ohio, Pennsylvania and western New York. It also occurs in the tributaries of the St. Lawrence River, the lakes of northern New York State, and has been taken as far east as Lake Champlain.

Owing to the existence of the several canals in the upper part of New York State, avenues offering an extension of distribution have been taken advantage of by the soft-shelled turtles. Thus we may understand why occasional specimens are found in the Hudson River. The headquarters of this species should be given, however, as the Central States. Here the turtles are so numerous as to be a real nuisance to the angler.

* Seen on all the species.

The Soft-shelled Turtles

THE BROWN SOFT-SHELLED TURTLE; OR UNARMED SOFT-SHELLED TURTLE

Trionyx muticus, (Lesueur)

From the two preceding species,* this soft-shelled turtle differs in the absence of spiny tubercles on the front margin of the carapace. It is also of smaller size and the head is proportionately narrower.

Colouration.—The head markings are like the Spiny Soft-shelled Turtle—the bands uniting at the base of the proboscis; on many specimens the head markings are very obscure.

The carapace is brown or olive, and with but faint markings. They may be in the shape of short, line-like spots, or dull blotches.

Dimensions.—The smallest of the North American species, seldom attaining a length of shell of over ten inches. The measurements of a specimen taken in the Mississippi River, near St. Louis, Mo., are given:

Length of Carapace	6 $\frac{7}{8}$ inches
Width of "	6 $\frac{1}{2}$ "
Width of Head.	$\frac{7}{8}$ "

Distribution.—Central and northern tributaries of the Mississippi River and tributaries of the St. Lawrence. The species is not so widely abundant as the Spiny Soft-shelled Turtle.

EMORY'S SOFT-SHELLED TURTLE

Trionyx emoryi, (Agassiz)

Though this species is closely related to the Southeastern soft-shelled turtle, (*T. ferox*) *there are no tubercles on the front margin of the carapace*. The proboscis is rather short.

Colouration.—Carapace olive, with the usual, pale margin. In place of the ring-like markings of the allied species, there are numerous black dots.

The head markings appeal to those of *ferox*. The pale lines unite in front of the eyes, but they fuse into a pale, trian-

* It must herewith be explained that the arrangement of the species is not according to technical classification, but in a fashion that will be most readily comprehended by the less advanced worker. In reality, *T. muticus* is most nearly allied to *T. spinifer* and should thus follow it, while the same condition relates to *T. ferox* and *T. emoryi*.

The Soft-shelled Turtles

gular blotch, extending from between the eyes to the base of the proboscis.

Dimensions.—The shell of an adult specimen is about twelve inches long.

Distribution.—Tributaries of the Rio Grande River, in Texas and Mexico.



SPINY SOFT-SHELLED TURTLE, *Trionyx spinifer*

The specimen figured is half-grown. At maturity the ring-like markings become quite obscure. Abundant in the Central States

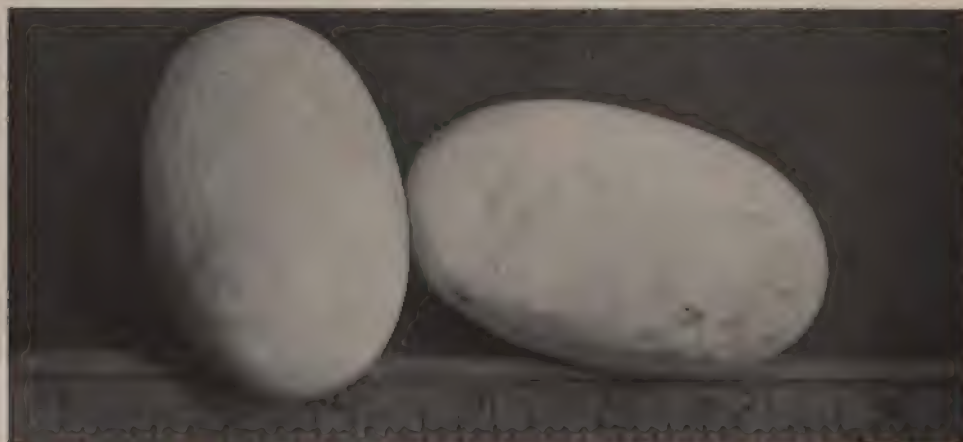


SPINY SOFT-SHELLED TURTLE, *Trionyx spinifer*

The plastron is soft and easily lacerated if the turtle leaves the water to crawl over a hard, rough surface



THE HOME OF THE ALLIGATOR
An inlet of the Savannah River, Hampton County, South Carolina



EGGS OF THE ALLIGATOR
The nest consists of a mound of dead leaves and twigs. It is about eight feet in diameter and two or three feet high. The eggs are well buried, closely packed, and range from three to five dozen

PART II.
THE CROCODILIANS
Order CROCODILIA

CHAPTER IX: THE CROCODILIANS

ORDER CROCODILIA

An Order Represented by Two Species in the United States—the American Crocodile and the Alligator

Classification.—The Order Crocodilia contains a single family—the *Crocodylidae*, and this is made up of six genera. There is a total number of about twenty-three species, which inhabit North and South America, Africa and Asia. The largest species occur in the Old World.

Structure.—The general structure of the Crocodilians is so well known that a detailed description would be superfluous.

The Crocodilians are huge, lizard-like reptiles, and amphibious in habits. The back is covered with rows of bony plates, each surmounted by a high, sharp ridge. The limbs, tail and abdomen are encased in a tough, leathery armour of coarse shields. Flat, massive, provided with powerful jaws and studded with long, stout teeth, the head is almost devoid of fleshy parts. Thick and muscular at the base, the tail is much flattened toward the terminal half and surmounted by raised, flat shields. It is a powerful swimming organ.

The North American species are easily separated, thus:

Genus *Alligator*. Head broad and rounded at the snout.
Blackish, with dull yellow markings.

THE ALLIGATOR, *A. mississippiensis*.

Distribution.—Southeastern United States.

Genus *Crocodylus*. Head narrow and pointed at the snout.
Olive, with blackish markings.

AMERICAN CROCODILE, *C. americanus*.

Distribution.—In the United States—southern Florida, only.

These reptiles are herewith considered in detail:



SPINY SOFT-SHELLED TURTLE, *Trionyx spinifer*

The specimen figured is half-grown. At maturity the ring-like markings become quite obscure. Abundant in the Central States

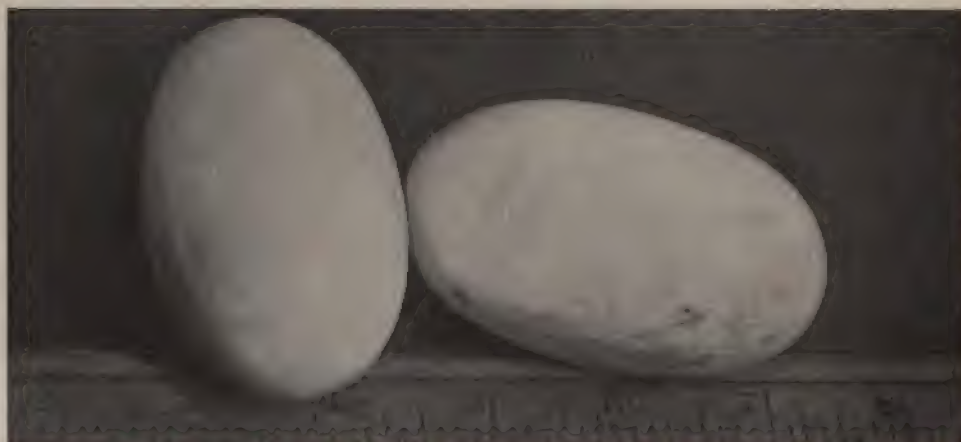


SPINY SOFT-SHELLED TURTLE, *Trionyx spinifer*

The plastron is soft and easily lacerated if the turtle leaves the water to crawl over a hard, rough surface



THE HOME OF THE ALLIGATOR
An inlet of the Savannah River, Hampton County, South Carolina



EGGS OF THE ALLIGATOR

The nest consists of a mound of dead leaves and twigs. It is about eight feet in diameter and two or three feet high. The eggs are well buried, closely packed, and range from three to five dozen

PART II.
THE CROCODILIANS
Order CROCODILIA

The Crocodilians

caught away from the water and prevented from seeking its escape in the element in which it is so agile and at ease. The tail and jaws of an alligator seven or eight feet in length are formidable weapons and usually put into simultaneous action. Unable to turn the head to any extent, upon the short, thick neck, the reptile bends its entire body, in bow-like fashion, reaching sideways at an enemy, this motion bringing the tail around toward the head and with force enough to knock a man from his feet and sweep him in the direction of the infuriated brute's crushing powers. The jaws possess great strength, and, armed as they are, with large and numerous teeth, could crush the bones of a man's arm or leg without difficulty. In snapping at an object that has greatly provoked its anger, the jaws of a large alligator will often come together with a deep, booming sound, not unlike the striking of a bass drum.

If discovered in its basking place and the escape is not cut off the wild alligator will always rush for the water in clumsy fashion, plunge in and dive out of sight. So great is this reptile's fear of man that no matter what may be the size of the saurian, from a twelve-inch "barker" up to a twelve-foot bull that shakes the night air of the lagoons with his bellowings, the same shyness is to be noted. A man may with perfect safety go bathing in waters inhabited by alligators and feel assured that his presence has inspired the reptiles to place a substantial distance between him and themselves.

The food of the alligator consists of fish, mammals and birds. The younger individuals feed largely upon the former, together with frogs, tadpoles and insects. Water fowl fall the frequent prey of the big specimens which approach the unsuspecting quarry from below as the latter paddle upon the surface. A ten-foot alligator can easily swallow a medium-sized duck, entire.

If the prey is too large to be swallowed whole, it is shaken violently and thus torn. This shaking process is so vigorous that the entrails of the prey are often sent flying for a distance of twenty feet or more. Sometimes, when swimming for shallow water, there to swallow the food, another alligator is met and the two reptiles indulge in a not altogether bad-tempered tearing up of the food. Each takes a firm hold and turns around bodily in the water in an opposite direction from that of the adversary. The manœuvre soon divides the morsel. As the



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ALLIGATOR *Alligator mississippiensis*.

In all of the large rivers of the South the Alligator has been practically exterminated. It is yet moderately abundant in lakes and lagoons surrounded by heavy timber or swampy areas.



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AMERICAN CROCODILE *Crocodylus americanus*.

The extreme southern portion of the Florida peninsula is the only portion of the United States in which the American crocodile is abundant. This species is abundant in Mexico and Central America.

Illustrated by a true

throat of the alligator is furnished with a valve-like development, the reptile is able not only to open its mouth, but to break the bones of its prey while under water in a series of masticatory movements and without a drop of water passing beyond the valve, which is voluntarily opened and closed. To swallow its food the alligator must raise its head above the water. This it sometimes does by lurching suddenly upward while in deep water and swallowing with a single gulp. It more frequently comes to shallow places to swallow the prey. In this habit it differs from other semi-aquatic reptiles—like the turtles. The latter not only swallow their food beneath the surface, but are unable to eat otherwise. The writer witnessed the greediness of a very large alligator, illustrated in a tragic manner. As a dog, weighing about fifty pounds, unwarily approached the edge of this creature's tank, it was suddenly grasped and before completing its first yelp of terror was dragged beneath the surface. A few minutes later the twelve-foot saurian appeared at the top, holding the dead canine in its jaws. The dog was shifted about, amid the sound of breaking bones, and swallowed head first, and entire, after a few gulps.

Among reptiles, the alligator is unique in giving voice to a *loud* noise, or bellow. In the Southern swamps the night air carries the call of a large individual for a mile or more. The "bellowing" of an alligator is hard to describe, as it varies greatly in cadence according to the size of the reptile, and from a sound like the gentle "mooring" of a cow with the small alligator of about five feet, ranges to a thundering and tremulous blast of the big male—ten feet or more in length. As the patriarch gives voice to his roars, the scent glands—on the under-surface of the chin—are opened and fine, steamy jets of a powerful, musky-smelling fluid float off into the heavy, miasmatic atmosphere of the bayou. The odour may be carried for miles and to the negroes it always signifies, "a big, ol' 'gator."

THE AMERICAN CROCODILE

Crocodilus americanus, (Laurenti)

Little in the way of description is necessary as under the head of the Alligator, the structure of the present species has been compared with the former.

The Crocodile is a more slender and a much more agile

The Crocodilians

species than the alligator. Its long, narrow and pointed head at once distinguishes it.

Compared with the alligator, the teeth are larger (longer) and more pointed. By a peculiar development of the snout—immediately in front of the nostrils—two of the teeth of the lower jaw usually pierce the upper, bony process and their points glisten above the dark skin of the snout.

Colouration.—Young specimens are distinctly greenish, with black markings. Half grown individuals and young adults are olive, while very old specimens are dull gray. The olive or gray tints may be at once recognised from the black, or blue-black of an alligator, and if the creature be in the water and the head not clearly distinguishable, the colour is a good character upon which to judge the animal's kind.

Dimensions.—As the Crocodile in Florida frequents portions of the peninsula that are less disturbed than the domains of the alligators, occasional very large specimens are recorded. The maximum length appears to be about fourteen feet. Specimens eleven and twelve feet long are not rare in the extreme southern portion of the state.

Following are the measurements of an adult, female specimen, in the New York Zoölogical Park:

Total length.	10 feet, 2½ inches.
Length of Tail	4 feet, 9 “
Length of Head	22 “
Length of Largest Teeth	1 “
Girth of Body	3 feet, 11 “
Weight	280 pounds.

Distribution.—The American Crocodile was first discovered in the United States by Mr. William T. Hornaday. North of Mexico, the species occurs only in the extreme southern portion of the Florida peninsula. Regarding it, Mr. Hornaday writes: “The presence of a true crocodile in Florida was not discovered until 1875, when a pair of specimens of large size were collected in Arch Creek, at the head of Biscayne Bay, by Mr. C. E. Jackson and the writer. The male measured 14 feet 2 inches (with 4 inches of his tail missing) and the female 10 feet 8 inches. Since that date, at least seventy specimens have been taken between Lake Worth and Cape Sable. Lake Worth is the Northern limit of the species, but it is most abundant in

the watery labyrinth of low land and shallow water where the mainland of Florida reluctantly sinks into the Gulf."

South of the United States the American Crocodile has an extensive range. It occurs from central Mexico to Ecuador and in the West Indies. It is more frequently abundant in salt-water marshes.

Habits.—The Crocodile is a considerably more agile and more vicious reptile than the alligator, yet in a wild state this species does not exhibit hostility toward man. The sight of a child will send a twelve-foot specimen rushing from its basking place for the water, and a man may even bathe with safety in rivers frequented by the species. The dangerous, "man-eating" crocodiles inhabit India and Africa.

In the habit of choosing certain basking places along the river bank and repeatedly crawling into these spots to sun, this creature resembles the alligator. It usually selects "water holes" (deep places in the streams) as its lair and here hides under the shelving bank on the lookout for food.

Of the nine captive specimens that have, at various times, been under the writer's observation, all have exhibited a uniform viciousness approaching actual hostility. This in direct opposition to the reptile's timidity when in a wild state and altogether different from the good-natured demeanour of captive alligators which learn to follow their keeper about like dogs, feed from his hands and permit the man to walk over their backs in unceremonious fashion. One captive (Florida) crocodile was so hostile that it would chase the keeper from its enclosure if he attempted to enter and for a quarter of an hour or more would hiss with much vigour and snap its jaws with rage. Another large specimen permitted the keeper to enter the paddock, but could never be trusted as it would frequently turn upon the man with wonderful agility. This creature could actually run, with some speed and grace, the body raised fully a foot from the ground. Compared with the clumsy movements of an alligator, its activity was surprising for a creature of so similar a structure. In spite of their ugliness, these captive crocodiles were voracious in their feeding and anxious enough to take food from their keeper's hand—in fact so greedy were the brutes that they were very dangerous. They would spring half their length out of the water by suddenly elevating the heavy tail,

The Crocodilians

and, as that member fell, like the weighted end of a see-saw, the body shot upward; this movement was assisted by an upward leap, bringing the animal fully five feet out of the water and with good certainty of aim at the object it was after. They were given fowls, large fish and raw beef, at intervals of about three days apart. On this food they flourished and grew at about the same rate as the alligators.

The specimen from which the measurements were taken deposited thirty eggs. These were three and one-half inches long and two inches in diameter. The shell was hard and considerably thicker than that of a duck's egg.

PART III.
THE LIZARDS
Order LACERTILIA

CHAPTER X: CLASSIFICATION OF THE NORTH AMERICAN LIZARDS

Of the North American reptiles the lizards present the greatest number of families. Following is a classified arrangement of the families and genera:

Order LACERTILIA

FAMILY	GENUS	NORTH AMERICAN SPECIES	
GECKONIDÆ (The Geckos)	<i>Phyllodactylus</i>	2 Species	Semi-arboreal
	<i>Sphaerodactylus</i>	1 "	" "
EUBLEPHARIDÆ (Geckos)	<i>Eublepharis</i>	1 "	Terrestrial
	<i>Anolis</i>	1 "	Arboreal
IGUANIDÆ (Iguanas, Chuckawallas, Desert Lizards, Swifts, Horned "Toads" Etc.)	<i>Ctenosaura</i>	2 "	Semi-arboreal
	<i>Dipsosaurus</i>	1 "	Terrestrial
	<i>Sauromalus</i>	2 "	"
	<i>Crotaphytus</i>	3 "	"
	<i>Callisaurus</i>	1 "	"
	<i>Uma</i>	4 "	"
	<i>Holbrookia</i>	5 "	"
	<i>Uta</i>	11 "	"
	<i>Sceloporus</i>	13 "	Mostly terrestrial
	<i>Lysoptychus</i>	1 "	Terrestrial
	<i>Phrynosoma</i>	12 "	"
ANGUIDÆ (Plated Lizards, Glass Snakes)	<i>Gerrhonotus</i>	4 "	"
	<i>Ophisaurus</i>	1 "	"
HELODERMATIDÆ (Beaded Lizards)	<i>Heloderma</i>	1 "	"
XANTUSIDÆ	<i>Xantusia</i>	5 "	"
TEIIDÆ (Includes the Striped Lizards)	<i>Cnemidophorus</i>	8 "	"

Classification

FAMILY	GENUS	NORTH AMERICAN SPECIES	
EUCHIROTIDÆ (Two-footed Worm Lizards)	{	<i>Euchirotis</i>	1 Species Subterraneous
AMPHISBÆNIDÆ (Worm Lizards)	{	<i>Rhineura</i>	1 " "
SCINCIDÆ (The Skinks)	{	<i>Eumeces</i>	14 " Mostly terrestrial
		<i>Lygosoma</i>	1 " Terrestrial
ANIPELLIDÆ (A limbless species)	{	<i>Aniella</i>	1 " Subterraneous
Total number of species: 97			

CHAPTER XI: THE GECKOS

FAMILIES GECKONIDÆ AND EUBLEPHARIDÆ

A Large Group of Granular-scaled Lizards, Represented by Four Species in North America

Classification and Distribution.—The Geckos form a very large group of lizards. They are divided into three families and these comprise over fifty genera. The species are distributed throughout the semi-tropical and tropical portions of the globe. They abound, in varied form, in the tropical portions of the Old World, some frequenting the dense jungles, others living upon burning, desert wastes practically devoid of other signs of animal life. A vast majority of the species are nocturnal.

Structure.—The Geckos have not the scaly aspect of most lizards. Their skin appears soft, like that of a toad; this is caused by their very minute scales. The eyes are usually large, with an elliptical pupil. With most of the species the toes are much flattened, or expanded in the form of adhesive disks, thus enabling the reptile to run up a smooth, perpendicular surface. The tail is characteristic in its thick, swollen outlines; it is easily separated from the body.

Many of the tropical Geckos attain a large size—a foot or more. All of the North American species are diminutive.

Two families of this group are represented in the United States—the *Geckonidæ* and the *Eublepharidæ*, by a total number of four species. The families are separated by a slight difference of the skeleton.

The North American species may be recognized from other lizards by the flat, pointed head which is swollen at the temples, the minute scales of the body and the short, very thick tail. The usual length is from three to four inches. One species occurs in Florida; another is found from Texas to California and two species inhabit the peninsula of Lower California.

Following is a key to the four North American Geckos:

The Geckos

FAMILY GECKONIDÆ

A. Scales coarsely granular.

Brownish yellow, with small, dark spots.

REEF GECKO, *Sphaerodactylus notatus*.

Distribution.—Key West, Florida; Cuba; Bahamas.

B. Scales exceedingly small.

*10—12 rows of enlarged, separated, wart-like scales on the back and sides.

Brownish yellow; 8—10 darker bands (transverse) on each side.

TUBERCULAR GECKO, *Phyllodactylus tuberculosus*.

Distribution.—Lower California.

**No enlarged, tubercular scales.

Gray; 5 broad, black cross-bands with pale centres.

CAPE GECKO, *Phyllodactylus unctus*.

Distribution.—Lower California.

FAMILY EUBLEPHARIDÆ

Brown, with pale yellow cross-bands or blotches.

BANDED GECKO, *Eublepharis variegatus*.

Distribution.—Texas to California.

The Genus *Phyllodactylus*: Twenty-five species are contained within this genus. They occur in Lower California, Mexico, Central America and tropical South America, Africa and Australia.

Following are details concerning the two species found in North America:

THE TUBERCULAR GECKO; WARTY GECKO

Phyllodactylus tuberculosus, (Wiegmann)

From the other North American Geckos this lizard may be told by the rows—10 to 12—of enlarged, separated, wart-like or tubercular scales, running lengthwise on the back and the sides; between these the scales are very minute. The toes are much flattened and expanded at the tips, the under sides of which form adhesive disks to aid the creature in running over smooth, upright surfaces. The eye is extremely large, with upright (elliptical) pupil.

Colouration.—Pale, brownish yellow or reddish-yellow above, with eight to ten darker transverse bands on each side of the body; a dark brown streak on each side of the head passing



In this work the length of a turtle's shell is the straight length from end to end—
not following the curve

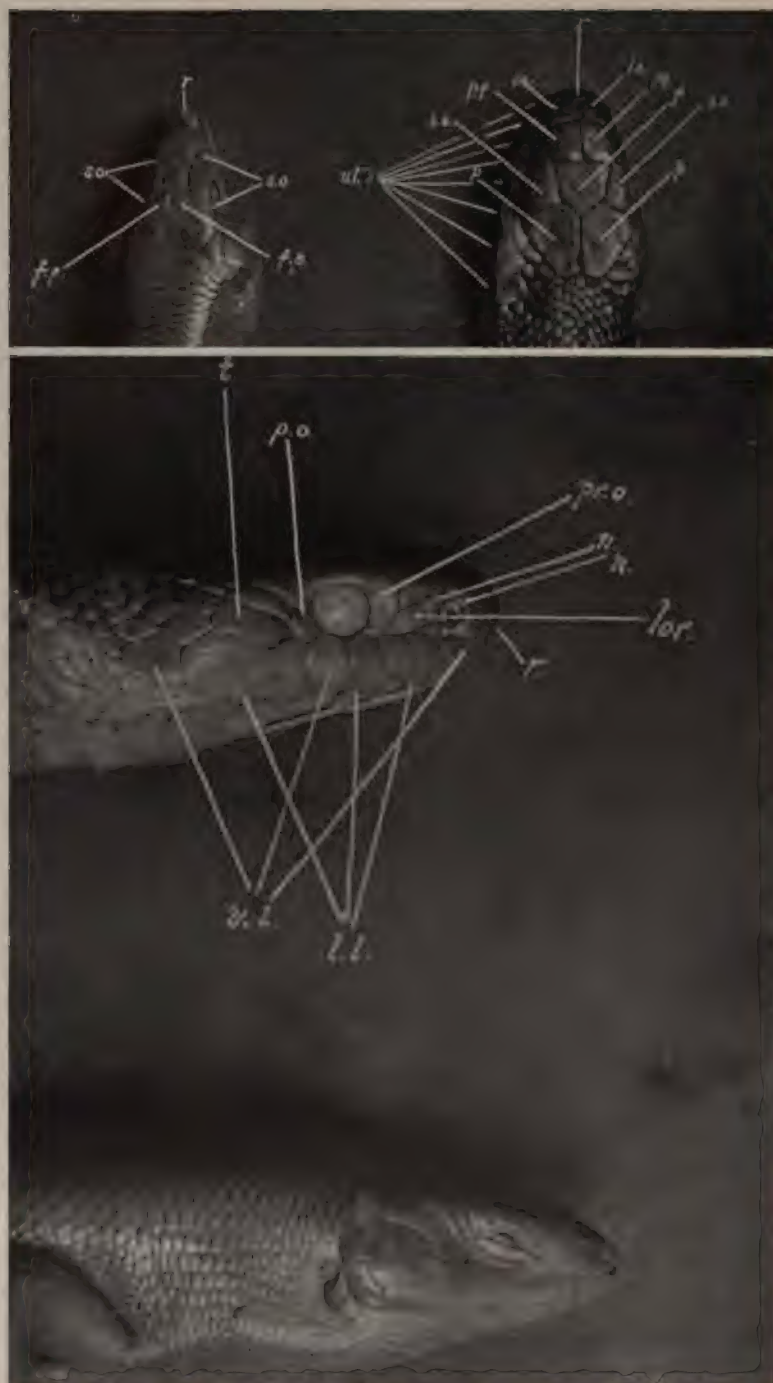


The length of a lizard's head is from the tip of the snout to the rear margin of the ear opening



The length of a serpent's head is from the tip of the snout to immediately behind the
junction of the jaw bones

METHODS OF MEASURING REPTILES



SCALATION OF THE HEAD. SNAKE AND LIZARD

r., Rostral; i. n., Internasal; p. f., Prefrontal; f., Frontal; s. o., Supraocular; p., Parietal;
 u. l., Upper Labials; p. o., Preocular; l. o., Loreal; p. v., Postocular; n., Nasal;
 t., Temporal; l. l., Lower Labials; f. p., Fronto-Parietal

(The head of the serpent is that of the Fox Snake, *Colester vulpinus*; that of the lizard represents
 a Skink, *Eumeces quinquelineatus*)

through the eye. The tail is ringed with a darker hue than that of the body. Lower surfaces white.

Dimensions.—Total Length $4\frac{3}{4}$ inches.
 Length of Tail $2\frac{1}{8}$ "
 Width of Head $\frac{1}{2}$ "
Distribution.—Lower California, Mexico and Central America.

THE CAPE GECKO

Phyllodactylus unctus, (Cope)

The scalation of the body is uniformly small. As with the preceding species, the toes are much expanded at their tips and form adhesive climbing organs—"suckers." As the species is confined to the Cape Region of Lower California, where but one other gecko is found—the preceding—and that is distinctly different in scalation, no lengthy description of the present reptile is necessary.

Colouration.—Gray above, with five broad, blackish cross-bands on the body, which are paler in their centres; tail also banded. A dark band on each side of the head, passing through the eye.

Dimensions.—Similar to the preceding species.

Distribution.—The Cape Region of Lower California.

The Genus *Sphaerodactylus*: About twenty species are known. They inhabit southern Mexico, Central America, Colombia and the West Indies. One occurs in southern Florida.

THE REEF GECKO

Sphaerodactylus notatus, (Baird)

A very small species, but with much coarser scalation than the preceding ones; the scales are keeled. Tail thick and short; limbs small and with expanded toes.

Colouration.—Brownish yellow, with scattered, circular spots of reddish-brown; these spots fuse, on some specimens, producing dull bands, extending lengthwise; usually a central, dark marking on the head, becoming broader in the rear.

Dimensions.—Total Length $2\frac{5}{8}$ inches.
 Length of Tail $1\frac{3}{8}$ "
 Greatest Diameter $\frac{5}{16}$ "
 Width of Head $\frac{1}{4}$ "
 Length of Head $\frac{3}{8}$ "
 Length of Hind Limb $\frac{1}{2}$ "
 Length of Front Limb $\frac{5}{16}$ "

The Geckos

Distribution.—Key West, Florida; the Bahama Islands; Cuba.

The family *Eublepharidæ*: The members of this family are closely allied to the *Geckonidæ*, differing from the typical geckos only in superficial characters of the skeleton. There are seven species of the *Eublepharidæ*, these comprising three genera. Most curious about the family is the distribution of the species. One inhabits the Southwestern United States; three are found in Central America, two in Southern Asia and the remaining species in Africa. Concerning this remarkable scattering of members of a small family, Boulenger remarks, in his Catalogue of the Lizards of the British Museum: "This extraordinary distribution seems to indicate that the few representatives of this small family are the remnants of some ancient, more generally dispersed group; it nevertheless remains a matter of wonder how forms, now so widely separated, have retained so great a resemblance, not only in structure, but also in the pattern of colouration."

A description of the only species occurring in North America proper, is given:

THE BANDED GECKO

Eublepharis variegatus, (Baird)

Small in size; the form is similar to the other small, North American geckos.

Colouration.—This very pretty creature displays, among different individuals, considerable variation of pattern. The arrangement of the colours may be divided into two phases—*banded* and *spotted*. With the former, the ground colour is rich yellow, crossed by broad bands of chestnut brown. On the body, these bands terminate on the sides; they completely encircle the tail however, which is thus vividly ringed with the light and dark hues. The head is dark, the eyelids margined in yellow.

The spotted form is brownish yellow, with small and irregularly scattered, brown blotches. The eye-lids are bordered with yellow; there is a light spot on the snout and a row of yellowish spots on the upper jaw.

Dimensions.—Following are the measurements of an adult specimen from Eagle Pass, Texas:

The Geckos

Total Length	3	inches.
Length of Tail	1½	"
Width of Body	$\frac{5}{16}$	"
Width of Head	$\frac{5}{16}$	"

Distribution.—Appears to be restricted to Texas, New Mexico, Arizona and California. It is rather abundant.

Habits.—Both the spotted and the banded forms occur in the same localities. The animal is rather nocturnal and may be found issuing from among loose stones or from cavities in the rocks about twilight. Its movements are fairly active, but seem slow when compared with the swifts and the "race-runners" or other lacertilians with long, powerful limbs. The food consists of small insects, carefully stalked, then taken by a rush. When caught, these creatures emit a faint, squealing sound, something like that produced by certain beetles (the "longhorns") when held in the fingers.

A number of specimens from Tucson, Arizona, were very sluggish, unless disturbed, when they appeared quite anxious to bite one's fingers, turning the head upon the side and opening the mouth widely, which position would be maintained for about ten seconds.

Several letters are at hand warning the writer of the very *poisonous* nature of this lizard. It seems that over a considerable portion of the distribution, the species is thought to be more dangerous than a poisonous serpent. This is a curious fallacy, for the lizard is in every way harmless. Its bright colours have possibly excited the idea of venomous properties.

CHAPTER XII: THE AMERICAN CHAMELEON

GENUS ANOLIS

The North American Representative of a Large, New World Genus of Lizards that are Remarkable in the Habit of Frequently Changing Their Colours

THE American "Chameleons" are members of the family *Iguanidæ* and represent the genus *Anolis*, to the number of over a hundred species. They are in no way related to the true chameleons (*Chamæleontidæ*) of the Old World, but rival those lizards in the characteristic of frequently and completely changing the body hues—an involuntary process, mainly influenced by light and temperature.

Anolis is a New World genus, distributed throughout Mexico, Central America, tropical South America and the West Indies. But one species occurs in the United States. With it, the trait of changing the body hues is most developed of any of the North American *Iguanidæ*.

THE AMERICAN CHAMELEON; ALLIGATOR LIZARD; FENCE LIZARD; "GREEN" LIZARD

Anolis carolinensis, (Cuvier)

A superficial glance at this lizard shows it to closely resemble the outlines of a young alligator—in miniature. The head is proportionately large and very distinct from the neck, but the tail is long, round and slender.

From all other North American lizards—except the geckos—this species may be immediately told by the formation of four of the toes on each foot; these are expanded, flattened and form adhesive pads; they enable the animal to traverse smooth, vertical surfaces with the same facility as the geckos.

The body is covered with minute scales, above and beneath; they are larger on the head and tail. On the top of the head is a ridge-like prominence of shape similar to a javelin head and

The American Chameleon

pointing toward the snout. The skin of the body is rather loose and hangs in a fold at the throat; with male specimens, this fold is dilatable into a "fan," and when fully expanded shows a bright red skin between the scales separated by the distension.

In proportion to the reptile's size, the limbs are long, particularly the hind pair. They are more developed for jumping and climbing than for running over the ground. Compared with the diameter of the orbit, the eyes are very small; this condition is caused by the surrounding skin or eye-lids, giving the eyes an independent, rolling movement and, consequently, great scope of vision.

Owing to the varying hues, no definite colour or pattern can be applied to the species. The colour varies according to the mood of the individual from different shades of brown into emerald green; during the darker phases, there is usually a pale, clouded band on the back. The colour changes are described under *Habits*.

Dimensions.—The measurements of an adult male specimen are given; the female is smaller, with a narrower and more pointed head.

Total Length.....	7 $\frac{1}{4}$	inches.
Length of Tail.....	4 $\frac{1}{8}$	"
Length of Head.....	$\frac{3}{4}$	"
Width of Head.....	$\frac{7}{16}$	"
Length of Hind Limb.....	1 $\frac{3}{8}$	"

Distribution.—Principally, the coastal region of the southeastern United States—in the northern portion of the range—from the Neuse River, in North Carolina, southward throughout Florida and westward to the Rio Grande, in Texas. Abundant in Mexico. Also found in Cuba, where it grows to a considerably larger size than in the United States.

Habits.—The American Chameleon acquires its name from the trait of changing colour to a remarkable degree. In this respect it rivals the true chameleons, of Africa. The most common hues of the *Anolis* are brown and green. It curiously displays the latter brilliant hue quite persistently in connection with conditions that widely differ. When sleeping, it is invariably pale green, the abdomen immaculate white. When pugnaciously fighting with its fellows, the same bright hue appears. If badly frightened, the green soon suffuses the entire body.

The American Chameleon

At other times, the lizard may be of a dark, rich brown. This is often the hue assumed in the brightest hours of sunlight.

In collecting these lizards and placing them in wire-covered boxes the writer has always noted their change from various hues, prior to capture, to a scrambling collection of several dozen emerald green lizards. If the gauze cage be laid down for half an hour or so while the collector rests the lizards soon take on a brownish tinge, but as soon as the box is again carried about, and the occupants are shaken up and frightened, the brilliant colour appears among them all. During the early morning or as the afternoon wears away, the prevailing tints are slaty or yellowish.

The change of colour is rapid. A dark brown example will fade to a pale leaf-green within three minutes time. During the colour changes the varying hues are striking; the brown gives way to a beautiful, golden yellow; this, in turn may fade to slaty gray and a general peppering of white dots appear over the back.

In describing these colour changes it is appropriate to correct a widespread and incorrect idea; this is to the effect that the change of colour is influenced by the shade of the object on which the reptile rests. *There is no relationship or influence between the lizard's colours, and its surroundings.* A brilliant green individual may often be seen resting upon a weather-stained fence rail, or a dark brown specimen hopping from one green leaf to another. The writer remembers an enterprising dealer who exhibited a number of these reptiles in a glass-fronted cage; the back of the cage was divided into four squares of vivid colour—yellow, red, green and blue. Continually annoyed by curious observers the lizards showed the brightest shades of green, but inconsistent with the dealer's idea, for they huddled together on the square of vermilion which was situated in the most secluded corner of the case.

The change of colour is brought about principally through temperature and light and their influences on the creature's activity; also by anger, fear and sleep. The most repeatedly observed colour is the green of the sleeping reptile. When poorly fed and in an enervated condition the skin shows dark spots and blotches. At death, the body is usually green, with scattered patches of black.

The American Chameleon

The males are provided with a peculiar throat pouch. This may be expanded at will, to the accompaniment of an emphatic nodding of the head. At best but an ornament and perfectly flat when extended, it is exhibited during times of love-making or previous to combats—and vicious indeed are the fights between rival males for an exceptionally desirable stretch of fence-rail; the fight is called off with the loss of a tail on one side or the other; with his writhing souvenir, the victor struts about for some time, repeatedly nodding his head and dilating the throat fan while his body glows in a resplendent tint of emerald.

Strictly diurnal, the "Chameleon" appears with the rising of the sun, from where it has been sleeping; the resting place is generally a horizontal twig, well hidden among the leaves. The morning prowl is prompted by a hungry stomach. A large and tempting fly is stalked in the same fashion as a cat does a bird. Slinking forward, with body close to the bough, the lizard nears the victim, then quivers for the rush; there is a dash, with open jaws, and the prey is caught. Before the fly is swallowed the sharp little teeth are employed to masticate it. The *Anolis* confines its food entirely to insects. It will not eat earthworms, nor will the majority of small lizards.

In captivity the "Chameleon" makes a pretty and amusing pet, soon learning to take food from one's fingers. Mealworms and flies are the favorite food; it will also take roaches. The sugar and water diet so often imposed upon these reptiles by kindly-intentioned but misinformed people, is only taken by the lizard to quench a killing thirst, for these little animals drink much and if deprived of water will rapidly weaken and die. Their method of drinking is to lap the drops of dew from vegetation. The quarters of captive lizards should be sprinkled daily that the reptiles may drink in this manner; they do not readily find a dish of water.

While it is agile and favoured by the adhesive foot pads that enable it to run over smooth surfaces, at various angles, this lizard is not nearly so difficult to capture, if a little strategy is employed, as the swifts (*Sceloporus*) or the race-runners (*Cnemidophorus*). Compared with those lacertilians, its gait is very tardy.

CHAPTER XIII: THE IGUANAS

Large Species That May be Recognised by Their Fine Scallation and Spine-like Crest

THE true Iguanas are represented in North America by two species that barely come within the limits of this work. One inhabits Lower California; the other extends northward from Mexico into southern Arizona.

Distribution of the Iguanas.—The large and powerful lizards, comprising several genera and known collectively as Iguanas, occur in tropical South America, Central America, Mexico and the West Indies.

Cyclura and *Melopoceros* are restricted to the West Indies; *Conolophus* and *Amblyrhynchus* occur in the Galapagos Islands; the species of *Ctenosaura* inhabit Central America, Mexico and the extreme southwestern portion of the United States. The genus *Iguana* has the most extensive distribution, ranging from Mexico into Brazil.

General Structure.—Most of the species are of very large size—some growing to a length of six feet. The body is heavily built, the head is large and blunt, with powerful jaws, and the tail is long. Most characteristic is the scalation of the body. The scales are minute, but upon the back is a crest of large, flat spines.

The Spiny-tailed Iguanas—Genus *Ctenosaura*: Two species of this genus are the only Iguanas occurring in North America proper. The genus may be popularly defined by the structure of the tail. The appendage is covered with rings or whorls of large, spiny scales. As may be appreciated, such a scalation is really formidable and the tail is employed as an offensive weapon, in dealing quick, lashing blows. The feet are provided with long toes and strong claws and these lizards are very agile climbers. In fact, partially arboreal in habits.

Ctenosaura is composed of six species.

Key to the North American Iguanas

- I. A row of upright spines on the back; tail with rings of large spines. Genus *Ctenosaura*.

Size large—three to four feet.

- a. Crest extending a little more than two-thirds the length of the back.

Brown, with blackish cross-bands.

CAPE IGUANA, *Ctenosaura hemilopha*.

Distribution.—Lower California.

- b. Crest extending to the rump.

Black, above and beneath.

BLACK IGUANA, *Ctenosaura multispinis*.

Distribution.—Southern Arizona to Mexico and Central America.

- II. A row of flat, enlarged scales on back; tail with rings of small scales. Genus *Dipsosaurus*.

Size small—about twelve inches.

Pale brown, a net-work of darker brown.

DESERT IGUANA, *Dipsosaurus dorsalis*.

Distribution.—Deserts of the southwestern United States; Mexico.

The Cape Iguana, *Ctenosaura hemilopha*, Cope. As this large species is confined to the Cape Region of Lower California, where it is the only reptile of its kind, it cannot be confused with other lizards. The spiny crest on the back extends but a little more than two-thirds the length of the body on male specimens, barely two-thirds on the female. The tail is covered with alternate rings of very large spiny scales, and small, smooth scales; on the top of the tail the spines are upright, forming a crest, though they are less developed than the spines on the side.

Colouration.—Olive gray, or greenish above, with blackish crossbands on the forward portion of the body.

Dimensions.—Total length, 4 feet; length of tail, 32 inches; greatest width of head, 3 inches.

Distribution.—The Cape Region—Lower California.

The Black Iguana, *Ctenosaura multispinis*, Cope. General structure similar to the Cape Iguana, but the spiny crest extends farther back—to the rump.

Colouration.—Usually uniform black, above and beneath. Four specimens received by the writer were of an intense, jet-

The Iguanas

black; the crest of spines and the ringed, thorny tail, as polished as ivory.

Occasional specimens are blotched with brown. Young individuals are often bright green.

Dimensions.—Like the preceding. (See measurements.)

Distribution.—Extreme southern Arizona, to Central America.

Habits.—If cornered, a large, Spiny-tailed Iguana is a really dangerous creature. The brute's offensive powers are quite in keeping with its looks. Sombre in colouration, powerful of body, the head thick-set with swollen jowls, the eyes dark and keen with blood-red corners and, to add to the general fighting aspect, the formidable tail; this appendage bristles with coarse spines.

If the creature has a chance to escape, it always flees from man. It may be surprised while basking in the open, when it rushes for cover; most frequently it is seen stretched upon a fallen tree, or on a low branch, and then the escape is precipitous—utterly without dignity; the reptile actually hurls itself to the ground and tears through the undergrowth with a crashing that might be produced by a frightened cow.

If the lizard is cornered, it flashes into a state of viciousness that might stand off a well-trained dog. The tail is lashed from side to side and the powerful jaws are open and ready to seize the enemy in a bulldog grip.

As captives, these lizards require a great amount of sunshine and very large cages. They are omnivorous feeders and are fond of tender vegetables, such as lettuce and celery tops; they will also eat various fruits, but among these prefer bananas. Most specimens feed voraciously upon young birds and small rodents, and are surprisingly agile in catching the prey. It is shaken to death, then quickly swallowed entire. In a wild state, the Iguanas are undoubtedly carnivorous to a great extent.

In Mexico, Central America and South America, Iguanas are brought to the market in large numbers. They are regarded as an excellent food and alleged to taste like chicken.

The Genus *Dipsosaurus*: One species—probably a degenerate iguana—forms this genus. It is a desert reptile, occurring in the southwestern portion of the United States and in Mexico. In structural characters it seems to be closely allied

to the large, arboreal iguanas of Mexico and Central America. The general aspect and size appeal somewhat to the lizards of a succeeding genus—*Crotaphytus*.

THE DESERT IGUANA; KEEL-BACKED LIZARD

Dipsosaurus dorsalis, (Baird & Girard)

The body is stout and rounded, with very long, gradually tapering tail. In proportion to the size of the body the head is very small; it is thick-set and rounded.

On the centre of the back, from immediately behind the head and extending down the greater length of the tail, is a single row of enlarged scales; these are distinctly keeled. This characteristic scalation shows a close relationship to the typical iguanas. The general scalation of the body is fine and granular; the scales on the tail are larger than on the body, are keeled and arranged in ring-like series.

Colouration.—Pale brown above, with wavy, parallel dark brown or black lines—running lengthwise; these lines tend to form a net-work or reticulate pattern, enclosing yellowish spots. The tail is generally yellowish, with dark, ring-like markings above. Pale and immaculate beneath.

Dimensions.—An adult specimen from southern Arizona, was measured as follows:

Total Length.	11 $\frac{1}{2}$ inches.
Length of Tail.	7 $\frac{1}{2}$ "
Greatest Diameter.	1 $\frac{3}{8}$ "
Width of Head*.	$\frac{3}{4}$ "
Length of Head—ear to snout.	$\frac{7}{8}$ "
Length of Hind Limb.	2 $\frac{7}{8}$ "
Length of Front Limb.	1 $\frac{5}{8}$ "

Distribution.—Desert regions of the southwestern United States and northern Mexico. The species occurs in Lower California, the desert regions of southern California and in the Colorado and Mojave Deserts of Arizona; it is also found in the Amargosa Desert, Nevada.

Habits.—Like the other thick-bodied desert lizards, this species is largely herbivorous. It feeds upon buds, small flowers and tender leaves. Captive specimens will greedily eat the

* Note the proportionately small head.

The Iguanas

blossoms of red clover, swallowing each flower practically entire, after but superficial attempts at mastication.

The tail of this lizard is very brittle and if the creature is picked up by that member, parts with it readily by a quick twist of the body.



REEF GECKO, *Sphaerodactylus notatus*
The only true gecko found in the United States. Occurs near Key West, Florida



BANDED GECKO, *Eublepharis variegatus*
Represents the family Eublepharidae, which differs from the Geckonidae in the structure of the skull and in having functional eye-lids



AMERICAN CHAMELEON, *Anolis carolinensis*
Male with the throat fan extended



IGUANA, *Cyclura carinata*

A West Indian species, closely allied to the Iguanas that inhabit the extreme southwestern portion of the United States



DESERT IGUANA, *Dipsosaurus dorsalis*

Traces of a dorsal crest show the relationship of this lizard to the larger Iguanas of the tropics. It is mostly herbivorous

CHAPTER XIV: THE GENERA *SAUROMALUS* AND *CROTAPHYTUS*

Fine-scaled Representatives of the Iguanidæ

The Chuckawallas—Genus *Sauromalus*: Of the two species, one is little known; the other is a desert reptile and fairly common in the southwestern portion of the United States.

The Chuckawallas are very stout, with a fine, granular scalation, both above and beneath, and on the top of the head; the scales on the neck are spiny. One of these lizards attains a considerable size—two feet or more; the tail is short and blunt. Fully adult specimens are of a dull, uniform brown.

Definition of the Species.

Scales of the upper surface of neck much enlarged and spiny. Scales of the back terminating in a sharp point. Attains a maximum length of about two feet.

ISLAND CHUCKAWALLA, *Sauromalus hispidus*, (Stej.)

Distribution.—Has been found on Angel Island, Gulf of California.

Scales of the upper surface of neck, small and granular. Scales of the back rounded.

Attains a length of about fourteen inches.

COMMON CHUCKAWALLA, *Sauromalus ater*, (Dumeril).

Distribution.—Deserts of the Southwest.

Following is a detailed description of the common species:

THE CHUCKAWALLA

Sauromalus ater, (Dumeril)

The largest lizard of the southwestern desert region, with the exception of the Gila Monster (*Heloderma*). Body very broad; head proportionately large. Both pairs of limbs are stubby; the tail is thick, flattened (horizontally) and but slightly longer than the body.

Colouration.—Mature individuals are practically uniform

Sauromalus and Crotaphytus

in colour, being dull brown, olive or black above; abdomen rusty red, dotted with black.

The young are usually olive, marbled or spotted with black on the back; some are banded with reddish, this intermixed with yellow dots. The pattern is more pronounced on the tail.

Dimensions.—The measurements given are from a specimen taken a few miles south of Phoenix, Arizona:

Total Length	12	inches.
Length of Tail	5	"
Width of Body	3	"
Width of Tail, at base	1½	"
Width of Head	1½	"

Distribution.—Desert regions of the southwestern United States—southern Nevada and Utah, Arizona, eastern California, Lower California, and northern Sonora, Mexico.

Habits.—Little is known about the habits of the Chuckawalla or "Chuck-walla." It inhabits rocky places in the deserts.

The single living specimen in the writer's collection lived but a few months. When sleeping it was dark brown, but as the sun shone upon the sand of its cage and it became more active the body hue grew much lighter—almost yellow. This lizard had a very poor appetite. It occasionally nibbled at tender leaves of lettuce and celery. Dissection of the stomachs of preserved specimens shows the Chuckawalla to be quite herbivorous.

The Genus *Crotaphytus*: The three species are confined to the southern United States and northern Mexico; they are of moderate size.

Body stout, head large; tail very long, cylindrical and slender. Above and beneath, the scales are fine and granular. Top of the head covered with small, granular scales—larger than those of the body; scalation of the tail in narrow rings. Ear drum large; a fold of skin on the throat.

Key to the Species

- I. Head very large; body short and stout.
Pale, with numerous white or yellow dots; *a double black collar on neck.*

COLLARED LIZARD, *Crotaphytus collaris*.



CHUCKAWALLA, *Sauromastus ater*. A typical creature of the deserts, feeding upon the leaves and flowers of sparse vegetation



SAND LIZARD, *Uma notata*

A desert species that differs in its peculiar pattern from other American lizards



ZEBRA-TAILED LIZARD, *Collisaurus draconoides*

When running, this desert species carries the tail curled over the back



SPOTTED LIZARD, *Holbrookia maculata*

A species of the sub-arid regions of the Central and Western States.
It is a very swift runner, and feeds on small insects

Pale, with a yellow or white net-work (reticulate pattern) on body. Faint indications of a double black collar on neck. . . . No white dots on body.

RETICULATED LIZARD, *Crotaphytus reticulatus*.

- II. Head of moderate size; body more elongated. Yellowish, with large, rounded, dark blotches; spaces between the blotches dotted with red or yellow.

LEOPARD LIZARD, *Crotaphytus wislizenii*.

Detailed descriptions:

THE COLLARED LIZARD

Crotaphytus collaris, (Tay)

Body short and stout; head very large and distinct from the neck. Hind limbs long and powerful; much longer than the front pair and of a development to assist the animal in jumping.

Colouration.—While the colours are variable, the double black collar is a strong distinguishing feature.

The body colour may be yellowish, pale gray or bright green. Scattered over the back and the sides are numerous white or yellow dots; at the edge of the abdomen, these are often of a brick red. Behind the head are two, wide, jet-black bands, separated by a white or yellowish space—thus forming a double collar. The abdomen is greenish; the throat deep orange.

With most female examples, the black collar is less pronounced than on the male; on some it is merely represented by narrow strips of black. Most of the females are gray, or clay colour. During the breeding season they are spotted with bright, brick red; at such times the males assume vivid tints of green or yellow.

Dimensions.—Following are the measurements of an adult male:

Total Length	12 inches.
Length of Tail	8½ "
Width of Body	1½ "
" " Head	1½ "
Length of Front Limb	1½ "
" " Hind "	3½ "

Distribution.—Generally distributed and abundant throughout the Western states from Arkansas and Missouri to eastern California. Southern Idaho seems to be the most northern portion of the range; southward, the species extends into Sonora

Sauromalus and Crotaphytus

and Chihuahua, Mexico. It is most abundant in dry, rocky districts; it teems on the sub-arid plains of western Texas.

Habits.—Pugnacious, greedy and very active, this handsome lizard is in many ways interesting. It is cannibalistic and will greedily devour fair-sized specimens of the spiny, horned lizards (*Phrynosoma*), though the diet is often varied with blossoms and tender leaves. *When alarmed it dashes away on its hind legs, in kangaroo fashion.*

As a captive, the Collared Lizard is bright and hardy. It delights in a bed of dry sand, heated by an all-day flood of sunshine. Among examples of their kind, these lizards are peaceful enough, but no smaller lizards are safe in a cage with them. They will greedily consume swifts, horned "toads" and even young snakes. Their method of eating at once suggests that of the frogs, as the mouth is capacious, and the food is tucked into it with the front feet, in frog-like fashion. It is surprising to note the size of a lizard that one of these reptiles will swallow; it will engulf a swift that is longer than its head and body. One of the writer's specimens was found choked to death after it had tried to swallow a spiny swift (*Sceloporus*) that was nearly as big around as itself. The voracious animal had stuffed the head and shoulders of the prey into its mouth and down the throat, but there it became immovable, too large to go farther and too spiny to be ejected.

Aside from the cannibalistic habits, the Collared Lizard is fond of small flowers. It will devour the blossoms of red clover and the dandelion. Insects form a portion of the diet and captive lizards will eat grasshoppers, crickets and mealworms.

If an avenue of escape be open, these lizards will invariably dart away when startled. The method of locomotion is curious. For several feet the reptile skims over the ground in normal fashion, but as it attains full speed the tail is sharply raised and the body rears upward in kangaroo fashion; thence the creature rushes off on its powerful hind limbs. In this position it may run for a hundred feet or more. If it encounters a hole or small gully, the body is pressed against the ground, the hind limbs fold like those of a frog and a long jump follows. When cornered, the lizard turns quickly, opens the mouth widely and discloses a cavernous, black throat. The jaws are strong enough to produce a fair blood blister upon one's finger.



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COLLARED LIZARD, *Crotaphytus collaris*.

A wonderfully active species of the sub-arid regions and the deserts proper. It often rears the body upward, running rectily on the hind legs.



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LEOPARD LIZARD, *Crotaphytus wislizeni*.

Similar in habits to the Collared Lizard. It is both herbivorous and cannibalistic, preying largely upon the ground swifts and horned "toads." Note protective colouration.

Sauromalus and Crotaphytus

The writer's specimens dug hollows in the sand, under flat, shelving stones. They retreated to these hiding places shortly before sunset and always remained in them on cloudy days. One of the largest females—11 inches long—deposited 21 eggs, during the early part of August. The eggs were $\frac{7}{8}$ of an inch in diameter and $\frac{3}{8}$ of an inch long; their covering was as thin and soft as paper.

THE RETICULATED LIZARD

Crotaphytus reticulatus, (Baird)

Form very similar to that of the Collared Lizard; head large and very distinct from the neck.

Colouration.—Yellowish brown or grayish; head, body, limbs and tail covered with a net-work of pale gray or yellow; there may be traces of the double collar, but this is usually absent.

Dimensions.—Like the preceding.

Distribution.—Texas.

THE LEOPARD LIZARD

Crotaphytus wislizenii, (B. & G.)

Head much narrower than that of the preceding lizards. Body more elongated; tail very long and slender.

Colouration.—Yellowish brown, with large, rounded, black or brown blotches on the body and limbs. Between these blotches are numerous brick-red dots; the blotches may be outlined with borders of dots. There are usually pale, narrow lines crossing the back; the tail is coarsely reticulated with light and dark hues. Throat barred with black.

Dimensions.—Total Length 12 inches.
Length of Tail $8\frac{1}{2}$ "
Width of Body $\frac{3}{4}$ "
Width of Head $\frac{1}{6}$ "
Length of Head $\frac{1}{6}$ "

Distribution.—The Great Basin. Occurs from eastern Oregon to northern Mexico. Most abundant in the desert regions of eastern California, Nevada and Arizona. Does not range as far east as the Collared Lizard; the distribution in the East does not appear to extend beyond New Mexico and extreme southwestern Texas.

CHAPTER XV: THE SPOTTED LIZARDS; ZEBRA-TAILED LIZARDS

Small and Strictly Terrestrial Species of the Genera CALLISAURUS, UMA and HOLBROOKIA

THIS chapter embraces a number of small, ground lizards that live in dry and open places—the plains, sub-arid regions and the deserts. To match the pale sterile soil, their colours are light; the pattern of none is rich in hues, though some have the under side of the tail alternately barred with black and white and such species when running, carry the tail curled over the back, hence the popular title—the Zebra-tailed Lizards.

In the colouration, *Callisaurus* is precisely like *Holbrookia*—yellowish or grayish above, with two rows of darker, angular blotches on the back, but these genera are separated by *Uma*, according to the structure.

Outline of the Genera

General Characters.—Body rather stout; tail of moderate length, scalation of the body and tail, above, fine and granular; abdomen covered with larger, rounded scales. Top of the head with numerous rounded scales—not plates. Gray, yellowish or green, with two rows of angular blotches. Usually one or two ink-black spots on each side of the abdomen. Tail uniform white beneath, or barred with black.

I. *Ear Drum Exposed.*

Toes long, *without spiny fringes.* Genus *Callisaurus*.

Distribution.—Deserts of the Southwest.

Toes long, *with spiny fringes.*

Genus *Uma*.

Distribution.—Deserts of the Southwest.

II. *Ear Drum Concealed Under The Skin.*

Toes long, *without spiny fringes.*

Distribution.—Central and Western States.

Genus *Holbrookia*.

The Genus *Callisaurus*: A single species is recognised. It is confined to the arid regions of the southwestern United States and northern Mexico.



Holbrookia propinqua and *Callisaurus draconoides*. From above and beneath these small lizards appear very similar. The species of *Holbrookia*, however, may be immediately recognised by the absence of an ear-opening



Collared Lizard, *Crotaphytus collaris*—female. Note the narrow collar, as compared with the markings of a male specimen, on another plate



Desert Iguana, *Dipsosaurus dorsalis*. The row of enlarged scales on the back represents the crest of the tropical iguanas

STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS, *Iguanidae*



1



3



4



2

BREEDING HABITS OF LIZARDS

The greater number of lizards are viviparous—depositing eggs, which are left to hatch by the heat produced in decomposing vegetable matter. Some species, however, bring forth their young alive.

Fig. 1 shows a viviparous lizard, *Phrynosoma douglasii hermanni*. Fig. 2.—The young of the latter (two hours old when photographed.)

Fig. 3.—An oviparous species, *Holodermis insipida*. Fig. 4.—Egg of the latter species.

THE ZEBRA-TAILED LIZARD

Callisaurus draconoides, (Blainville)

Head small and flattened. Limbs very long; the hind leg applied forward reaches to or beyond the snout; tail flattened.

Colouration.—Grayish, dotted with white; two rows of angular, or V-shaped blotches on the back, fusing into angular bands on the tail.

Abdomen white, with a bluish patch on each side; each blue area contains two, sometimes three, ink-black bands. Lower surfaces of the tail of male specimens white, with black bars; the female lacks these bold markings, or they are but little evident.

The colouration is much like that of the Texas Zebra-tailed Lizard, *Holbrookia texana*, but the present species may be easily told by the exposed ear drum—*tympanum*.

Several varieties have been recognised—*gabbii* (Cope) and *ventralis* (Hallowell), but their varietal characters are not striking enough to appeal to the student. It should be remembered that the ear drum at once separates this lizard from all the species of *Holbrookia*.

<i>Dimensions.</i> —Total Length.....	5 $\frac{5}{8}$	inches.
Length of Tail.....	2 $\frac{1}{2}$	"
Width of Body.....	$\frac{3}{4}$	"
Width of Head.....	1 $\frac{7}{8}$	"
Length of Head.....	1 $\frac{9}{16}$	"

Distribution.—Western Texas to California; Lower California; northern Mexico. Principally abundant in the desert regions of eastern California, Arizona, southern Nevada and southeastern Utah; in these areas it is the most common of the various species of lizards.

Habits.—Like most of the terrestrial lizards this is a wonderfully active creature, running with such speed that the human eye can barely follow it. It usually curls the tail over the back when running, showing the vividly marked under-surface. Sometimes it runs for a short distance on the hind feet, a habit already explained in connection with the species of *Crotaphytus*. The food seems to consist partly of insects and of small blossoms and tender leaves.

The Genus *Uma*: Four species have been named. All seem to be rare. The genus differs from *Callisaurus* in a peculiar

The Spotted Lizards; Zebra-tailed Lizards

development of the feet. Along the inner and outer margin of most of the toes, is a fringe of flat spines; this character is seemingly Nature's provision to aid these lizards in rapidly traversing the desert sands; to assist in this arrangement, the under portion of each claw is hollowed out—cup-like—and has sharp edges. The same development is found with some of Old World desert geckos. It is interesting to find such pronounced examples of adaptation, on exactly similar lines, in forms so far removed from one another both in classification and *habitat*. Similar conditions have been described under the head of the Horned Rattlesnake, *Crotalus cerastes*.

Following is a key to the species of *Uma*, embracing some of the definitions of Cope, who named three of these lizards.

- I. Two black crescents on throat; a black spot on each side of abdomen.

Blackish, covered with pale and perfectly round blotches, the borders nearly touching; in the centre of each disk is a black spot. Abdomen white, with a black spot on each side. Two black crescents on throat, their points directed forward. Length about 8 inches; head and body, 4 inches.

ROUND-SPOTTED DESERT LIZARD, *Uma scoparia*, Cope.

Distribution.—Has been found near Tucson, Arizona.

- II. No black crescents on throat; a black spot on each side of abdomen.

Brownish, with black, longitudinal lines; the brown between the dark bands often broken up into rounded blotches, each containing a reddish spot. A large, black spot on each side of the abdomen; throat with narrow, black, longitudinal lines. Length about 7½ inches.

RED-SPOTTED DESERT LIZARD, *Uma rufopunctata*, Cope.

Distribution.—Deserts of southern California, southwestern Arizona and Lower California.

Colouration above, like *U. scoparia*. Abdomen white with a black spot on each side; chin and throat with a few blue or black spots.

OCELLATED DESERT LIZARD, *Uma notata*, Baird.

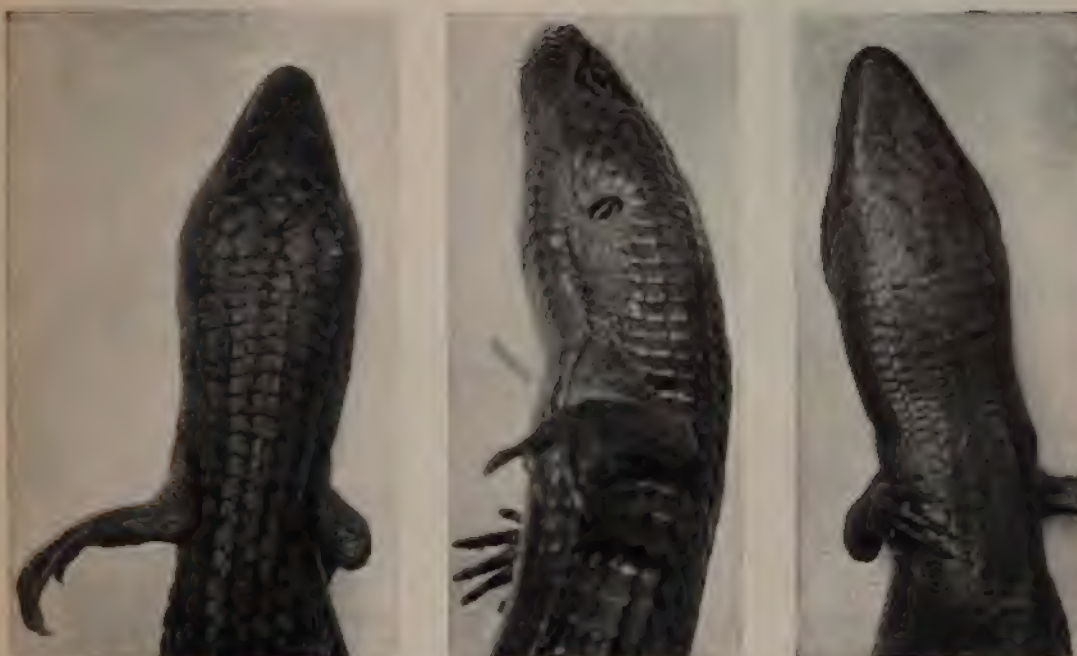
Distribution.—Mohave Desert, Arizona.

- III. No black spots on abdomen, or black crescents on throat.

Greenish, with darker spots. No black spots on the abdomen; seven black spots on under surface of tail.

COPE'S DESERT LIZARD, *Uma inornata*, Cope.

Distribution.—Colorado Desert.



PLATED LIZARD, *Gerrophonotus mullicarinatus*



GLASS "SNAKE," *Ophisaurus ventralis*. A limbless member of the Anguillae



GILA MONSTER, *Heloderma suspectum*

STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS. *Anguillae* and *Helodermatidae*



Typical representatives of the genus *Uta*. Note the rows of enlarged scales on the back; these set in a granular scabation. This development figures in the construction of the *Key* to identification, in the text



Sceloporus undulatus, male and female. The large blotches on the abdomen of the male are brilliant blue. This characteristic is to be seen among most of the species of *Uta* and *Sceloporus*



Heads of Horned Lizards, *Phrynosoma*. On the lower figure the ear drum is covered with a granular scabation, a character to be looked for in identification



Heads of Swifts, *Sceloporus*. The scabation over the eyes is a valuable aid to identification and figures in the *Key* to the species



The Spotted Lizards; Zebra-tailed Lizards

Habits.—Regarding the habits of the Occellated Lizard—*Uma notata*, is the following extract from an article by S. E. Meek* and representing the field notes of Edmund Heller.

"This species was taken only in the drifting sand areas of the bed of the Mohave River, where it is a common form. It has the peculiar habit of burying itself in the sand when pursued. The peculiar fringe of scales along the toes evidently serves to give the lizard sufficient speed over the loose sand to force its body beneath the surface. The sharp, depressed snout is evidently another modification to aid in getting beneath the sand. Usually the entire body is buried, but occasionally the tip of the tail protrudes. Their peculiar, mottled colouration does not render them protectively coloured on the white sand, but their peculiar mode of eluding pursuers renders this unnecessary, and at the same time limits them to areas covered with fine, drifting sand.

"The food of the species consists largely of the leaves of a forget-me-not (*Cryptantha*), which is abundant among the sand dunes. The young leaves of the desert willow (*Chilopsis*) are also eaten. The insect food consists of caterpillars, ants, bees, etc. One species was seen several feet up on an oblique limb of desert willow, in search of the young leaves which were just budding.

"Specimens were secured at Daggett, California."

The Spotted Lizards—Genus *Holbrookia*: The five species comprising this genus are rather small, moderately slender in proportions, though of distinctly flattened form. They are covered with very minute scales. All are pale in colour, and usually with two rows of large, wavy blotches on the back, and a row of similar, though less distinct blotches on each side. On most of the species there are two bluish or blackish bars on the lower portion of each side.

This genus differs from the closely allied genera by the absence of external ear disks, these being entirely concealed by the fleshy folds of the head. The limbs are well-developed, with long and slender toes.

From the following key, together with the illustrations, the student should be able to easily distinguish the species, which inhabit an extended area of the central and western United States and northern Mexico:

* Vol. VII, No. 1, Field Columbian Museum, Chicago, Ill. Zoölogical Series—Publication 104.

The Spotted Lizards; Zebra-tailed Lizards

Key to the Spotted Lizards.

General markings of all the species.—Pale brown, yellowish or gray with two rows of dark blotches on the back, these bluntly triangular, with the points directed toward the tail; on the tail they fuse together, forming V- or W-shaped blotches or bands. Similar, though more obscure blotches on the sides.

- I. Tail flat for nearly its entire length.
Black cross-bars on under surface of tail; a pair of black crescents on each side of abdomen.
 ZEBRA-TAILED LIZARD, *Holbrookia texana*, Troschel.
- II. Tail flat at base; greater part round.
 - a. *Black cross-bars under tail; no black spots on abdomen.*
 WHITE-BELLIED LIZARD, *Holbrookia lacerata*, Cope.
 - b. *No black cross-bars under tail; a pair of black spots on each side of abdomen.*
 Tail longer than head and body; limbs very long.
 MEXICAN SPOTTED LIZARD, *Holbrookia propinqua*, B. & G.
 Tail shorter than head and body; limbs moderate.
 COMMON SPOTTED LIZARD, *Holbrookia maculata*, Girard.
 - c. *No black bars under tail; no black spots on abdomen.*
 Limbs very long.
 SLENDER SPOTTED LIZARD, *Holbrookia elegans*, Boucourt.

There is no marked difference in the size of the different species. All vary in the intensity of the markings—the blotches on some examples are very obscure. Several varietal names have been proposed, but intergradations are too numerous to permit these to stand.

Dimensions.—The Zebra-tailed Lizard is perhaps the largest species. It attains a length of eight to ten inches. Following are the measurements of an average-sized adult of the Common Spotted Lizard (*H. maculata*):

Total Length.	4½ inches.
Length of Tail	2 "
Width of Body.	1½ "
Width of Head	½ "
Length of Hind Limb	1¾ "

Distribution.—Of the different species the Common Spotted Lizard has the most extended distribution. It occurs from Kansas to California, and southward into northern Mexico. The Zebra-tailed Lizard is common in Texas whence it extends westward to California; it occurs also in northern Mexico. The

The Spotted Lizards; Zebra-tailed Lizards

Mexican Spotted Lizard inhabits northern Mexico and the southern border of Texas. The Slender Spotted Lizard is a Mexican species and does not occur in the United States. *Holbrookia lacerata* is found in Texas. It seems to be most nearly allied to *H. maculata*.

Habits.—Although these small reptiles are very active and capable of climbing rocks with great agility, they pass most of their time upon the ground. They are generally found in dry, rocky situations, and dart away with bewildering speed when disturbed. The *H. texana* evinces the peculiar habit of running with the tail curled sharply upward, and, as this appendage is vividly marked with alternate black and white bars on the under side, imparts a unique appearance, hence the popular name—"Zebra-tailed" Lizard.

The food consists of insect prey, usually in the nature of beetles and grubs, for these lizards scamper about with too much fuss and rustle to capture flies and the like as do the velvet-footed "chameleons" and geckos.

CHAPTER XVI: THE SWIFTS

Two Genera—UTA and SCELOPORUS—Small, Rough-scaled Lizards

THE genera *Uta* and *Sceloporus* are closely allied. All of the species are of small or very moderate size. Those of the former genus may be termed the *Small-scaled Swifts*, owing to the minute character of the scales covering the greater portion of the back, while the species of *Sceloporus* may appropriately be considered under the title of the *Spiny Swifts*, as their scales are large, coarsely keeled, and terminate in sharp points of a bristling character.

The species of both genera appeal to one another in form, though the species of *Uta* are the most slender as a rule and have proportionately longer tails than the Spiny Swifts. *Uta* is essentially a genus of the southwestern United States and northern Mexico, while the species of *Sceloporus* are widely distributed, occurring in the central and southern latitudes of the United States, from the Atlantic to the Pacific Ocean and abounding throughout Mexico and Central America.

The Small-scaled Swifts, *Uta*: Sixteen species of this genus are recognised. The body is rather stout and flattened; the head is proportionately quite small. With some species the tail is of moderate length; with others, very long and slender. The greater area of the back and sides is covered with very small scales, but some species have enlarged rows of scales on the central portion of the back. The generally minute scalation at once distinguishes the members of this genus from *Sceloporus*—the latter having large, coarsely keeled and sharply pointed scales over the entire upper surface. The few rows of large, keeled scales seen on the central portion of the back of many species of *Uta*, resemble the general scalation of the Spiny Swifts. Many of the species of *Uta* have coarse, spiny scales on the tail like the members of *Sceloporus*. One of the striking points of similarity to be observed with species of both genera is a colour

The Swifts

character of the males. These exhibit a brilliant patch of blue on each side of the abdomen.

The species of *Uta* are exceedingly active—hence the popular name of Swift. The general colouration is gray or brown, with darker transverse bands or blotches. With individual specimens, the ground colour and intensity of the pattern varies greatly, according to light, temperature and the general activity of the reptile itself.

As this is a rather large genus and none of the species evinces any marked differentiation of colours, the writer has prepared a concise list of descriptions, which somewhat appeals to the form of *key* employed elsewhere in this work. The divisions, in this list, are based upon the formation of the scales of the back. The key embraces only those species occurring in the United States and Lower California.*

Division I. Scales of the back small, *smooth* and of about equal size. Scales of the tail small and smooth—*not spiny*. *This division contains the largest species: they attain a length of twenty inches.*

Three black cross-bars on body.

THREE-BARRED SWIFT, *U. thalassina*, Cope.

Body stout; tail very long. Dark green, with three black cross-bars. Abdomen greenish. Under side of tail and limbs yellow. The largest and handsomest species of the genus. Attains a length of 20½ inches, of which the tail forms 13¾ inch.

Distribution.—Cape Region of Lower California.

Four black cross-bars on body.

FOUR-BARRED SWIFT, *U. repens*, Van Denburgh.

Very similar to the preceding, but with four black cross-bars. The measurements of the type specimen are smaller than those given for the Three-barred Swift.

Distribution.—Rare. Taken in Lower California.

Division II. Scales of the back, small, *smooth* and of about equal size. Scales of the tail of much larger size—*keeled and spiny*.

MEARNS' SWIFT, *U. mearnsii*, Stejneger.

Body olive, with irregular, blackish cross-bands, between which are pale spots. A jet black band across the shoulders. Terminal third of tail blackish; remainder brownish with wide, black cross-bands. Abdomen greenish-white—bluish on the flanks. Attains a length of about 9 inches; tail 6 inches.

* In preparing this list, the writer has practically popularised Prof E. D. Cope's very complete, technical key to the genus *Uta*.

The Swifts

Distribution.—Lower California and extreme southern California.

Division III. Scales of back small and of uniform size—*bluntly keeled*. Tail with larger, spiny scales.

STANSBURY'S SWIFT, *U. stansburiana*, Baird & Girard.

Dark green or grayish, with two series of small, dark blotches on the back, which are surrounded by scattered, bluish dots. A pale band on the side, and frequently a dark, brownish blotch behind the forelimb. Abdomen pale. One of the smallest species. Following are the measurements of an adult specimen: Total length, $4\frac{1}{2}$ inches; length of tail, $2\frac{1}{2}$ inches; width of body, $\frac{1}{2}$ an inch; width of head, $\frac{1}{3}$ of an inch.

Distribution.—The most abundant species of the genus. It occurs from western Texas to California, inclusive, and northward to Nevada. Very common in the deserts of Arizona and eastern California.

PALMER'S SWIFT, *U. palmerii*, Stejneger.

Larger than the preceding. Bluish-drab, with numerous, small, whitish dots, two to three scales large, irregularly scattered over the body. *No dark blotches on the back*. A dark spot behind the forelimb. Attains a length of about 6 inches.

Distribution.—San Pedro Martir Island, Gulf of California.

Division IV. Middle of the back with four to six rows of *much enlarged, keeled scales*.

Sub-division a. *Enlarged scales of the back in five or six irregular rows—smaller intermixed with larger ones*.

1. *A row of sharply conical, close-set scales on each side*.

ORNATE SWIFT, *U. ornata*, Baird & Girard.

Gray, with wavy, black cross-bands. Males with a large blue patch on each side of the abdomen. Head broad. Hind limbs shorter than the distance from vent to fold of skin under neck. Attains a length of six to eight inches.

Distribution.—Arid regions of New Mexico, Arizona and California.

1a. *No row of raised scales on the sides*.

OLIVE SWIFT, *U. levis*, Stejneger.

Large scales of the back very feebly keeled. Greenish above, without traces of other markings. The male has a blue patch on each side of the abdomen.

Distribution.—New Mexico. Rare.



BLACK-THROATED RACERUNNER, *Cnemidophorus gularis*, and SIX-LINED LIZARD, *Cnemidophorus sexlineatus*



Same as above



RED-HEADED SKINK, *Eumeces quinquelineatus*



Tail

Side of Head

Top of Head

Chin and Throat

FLORIDA WORM LIZARD, *Rhineura floridana*

STRUCTURAL CHARACTERS OF NORTH AMERICAN LIZARDS. *Teiida*, *Scincida*, and *Amphisbaniida*



STANBURY'S SWIFT, *Uta stansburiana*
Abundant in the sterile areas of the Southwest. Note the equal-sized
scales of the back



WHITE-BELLIED SWIFT, *Uta symmetrica*
Common in Arizona and New Mexico. Note the rows
of enlarged scales on the back



CLARK'S SWIFT, *Sceloporus clarkii*
One of the largest of the swifts. There is a spot of blue or green in each of the scales on the back

The Swifts

Sub-division b. *Enlarged scales of the back in four, regular rows—two rows on each side of a central row (or two) of minute scales. A row of enlarged, bristling scales on each side.*

WHITE-BELLIED SWIFT, *U. symmetrica*, Baird.

Head proportionately broad and flat. Hind limb as long or longer than the distance from the vent to the fold of skin under throat. Grayish or brownish, with darker, wavy cross-bands. Abdomen white; throat frequently yellow. Dimensions: Total length, $5\frac{1}{2}$ inches; tail, $3\frac{3}{8}$ inches; width of body $\frac{5}{8}$ of an inch; width of head, $\frac{7}{16}$ of an inch; length of head, $\frac{1}{2}$ an inch; length of hind limb, $1\frac{3}{8}$ of an inch.

Distribution.—Common in the desert regions of Arizona and eastern California.

Sub-division c. *Enlarged scales of back in from five to seven regular rows of about uniform size. A series of but slightly enlarged and scattered, conical scales on each side.*

BLACK-TAILED SWIFT, *U. nigricauda*, Cope.

Brown or gray, with wavy, black cross-bands. Tail blackish. Throat of the male orange. One of the smallest species—total length, $3\frac{3}{8}$ inches; tail $1\frac{1}{8}$ of an inch.

Distribution.—Lower California. Abundant.

BLACK SWIFT, *U. parviscutata*, Van Denburgh.

Sooty black above, with a few, irregularly scattered, light dots and indications of cross-bands of a deeper black. Male specimens differ from the preceding, to which this species is closely related, in possessing a blue patch, in place of orange, on the throat. Attains a length of $4\frac{1}{8}$ inches; tail occupying $3\frac{1}{8}$ inches of that measurement.

Distribution.—Lower California. Rare.

LONG-TAILED SWIFT, *U. graciosa*, Hallowell.

The most slender species of the genus. Tail excessively long—two and a half times the length of the combined head and body. Ashy-gray or reddish, with a series of darker, wavy cross-bars on each side. A band extending lengthwise on neck. Males with a blue patch on each side of the abdomen. Attains a length of eight inches, of which the tail occupies $5\frac{1}{8}$ inches.

Distribution.—Arid regions of southern Nevada, Arizona and eastern California, in the vicinity of the Colorado River.

Habits.—The Small-scaled Swifts are terrestrial lizards, living among rocks in the deserts and sub-arid regions of the Southwest. They are wonderfully agile and fairly skim over the ground when pursued, but do not appear to adopt the habit

The Swifts

of running on the hind limbs, as do some of the lizards already described—*Crotaphytus*, *Callisaurus* and *Holbrookia*. Although the feet are not provided with adhesive disks or pads, these creatures find a footing upon almost perpendicular cliffs, over which they may be commonly seen darting about, in search of insect food or scurrying away from the human intruder. Captive specimens are hardy if kept perfectly dry and very warm. Their cages should be so situated as to have sunlight for the greater part of the day. If deprived of the sun they seldom show a desire to feed. Mealworms and grasshoppers form a good diet. To provide the specimens with water, it is best to take a small branch, dip this in a pail and place it in the cage. They will be attracted to and drink the hanging drops, while a small pan of water in the cage might pass unnoticed for days.

The Genus *Lysoptychus*: Following the Small-scaled Swifts comes a genus containing a single species, which, in general characters of scalation, stands midway between *Uta* and *Sceloporus*. The scalation of the head and body appeals more strongly to the latter genus, but *there is a fold of skin under the throat*. The species is brown above, with faint darker markings in the form of transverse blotches. There is a blue patch on each side of the abdomen. It measures seven inches in length and is technically known as *Lysoptychus lateralis*, Cope. But one specimen is known. It was taken near San Diego, Texas.

The **Spiny Swifts**, *Sceloporus*. The species of this genus are considerably more difficult to identify than the lizards of the genus *Uta*. The arrangement of the latter in the form of a descriptive key is greatly facilitated by the strong characters displayed in the scalation of the back. Among the species of *Sceloporus*, there are no such sharply defined characters and in order to correctly identify the confusing array of North American species the student must note the different phases of scalation of the head. With this knowledge at hand it will be found that the different species fall into several groups, and identification is greatly simplified. There is, however, a considerable amount of variation to be seen among these lizards and the observer may be confronted with frequent specimens that defy adaptation to the groups in which they really belong. It might be said that this genus and *Cnemidophorus*, are by far the most puzzling,

as regards identification of species, among the North American lizards.

Distribution.—About thirty-five species of *Sceloporus* are recognised and of these about one-half the number inhabit Mexico and Central America, which countries might be termed the headquarters of the Spiny Swifts; they have extended their range into the southwestern portions of the United States, while a few species have reached such northern limits as Oregon and others have extended southward into the peninsula of Lower California. The range eastward has not been pronounced, for with the exception of two species the Swifts do not extend beyond Texas. Of these, one (*S. spinosus*) extends eastward from Mexico and Texas along the southern borders of the Gulf States to about Pensacola, Florida. The other (*S. undulatus*) abounds throughout the Eastern States, from southern New Jersey to Florida, where it may be seen in the country, scampering over every fence and stone wall or upon the trunks of fallen trees—particularly in the pinelands. It is the most widely distributed of any of the Spiny Swifts, being found from the Atlantic to the Pacific coasts.

General characters.—As members of their genus, the Spiny Swifts are readily recognised. They are covered above with large, lustreless and coarsely keeled scales, terminating in sharp, spine-like points—particularly on the limbs and tail. So sharply pointed are the scales of some of the species, that the reptiles appear to bristle all over, with needle-like spines. The abdominal scales are smooth and polished. The prevailing colours of all the species, above, are gray, brownish, or olive, with darker and wavy cross-bands. The throat and abdomen of male specimens display large patches of rich blue, which colour varies in hue according to atmospheric conditions and the activity of the individual. Female specimens exhibit little or none of the blue.

A few words regarding more precise anatomical characters are necessary before presenting a key to the identification of the species. The characters of the pattern are too weak and monotonous to be alone employed; they are secondarily important in the sub-divisions of a key. It is from *the scalation of the head* that we must draw the characters for the formation of an analytical table of the species. (See figures.) These

The Swifts

characters are of rather a technical aspect and need some explanation. Enlarged figures of heads among the illustrations should be thoroughly consulted. They show portions embracing the combinations of scales that are of the greatest importance—the *supraocular* scales—so called because of their covering the area directly above the eye. From the illustrations it will be noted that the *supraocular* plates or scales are arranged in a large, central series, which are bordered on either side by a row of minute scales. The inner row of these small *marginal* scales, arranged in crescentic form are, among all the species, in a single row. The outer marginal scales, however, may be present in *one, two or three rows*, according to the species. Hence we have an important distinction upon which to base a key. The genus has been treated with more detail than *Uta*, and a *concise*, descriptive list of the species follows the key. All complicated phraseology has been carefully omitted from the former, for the writer believes that the beginner should consider a difficult genus like this from a bird's-eye point of view for the most satisfactory results, rather than plunge into a bewildering mixture of comparisons.

The key follows:

Division A. A row of large supraocular plates, with a single internal border and *one* external row of small scales.

Sub-division I. *Internal border of small scales extending around forward two-thirds only, of crescentic margin.*

Color phases.—Grayish or brownish, with transverse, dark wavy bands. No *complete* black collar. Greenish-gray or scales with green centre; traces of black collar on sides of neck. Size large.

CLARK'S SWIFT, *S. clarkii*.

Yellowish, with a wide, reddish band on each side; indistinct, brown cross-bars. Size large.

BANDED SWIFT, *S. rosteromus*.

Brown to blackish; *scales spotted with blue or green, and red*. One of the largest species.

ORCUTT'S SWIFT, *S. orcuttii*.



COMMON SWIFT; FENCE LIZARD, *Sceloporus undulatus*
 SPINY SWIFT; TEXAS SWIFT, *Sceloporus spinatus*

The species figured live mostly on the trunks of fallen trees, scurrying about in search of insect prey. On the throat and abdomen of the males are brilliant blue patches



PACIFIC SWIFT, *Sceloporus undulatus occidentalis*



BANDED SWIFT, *Sceloporus undulatus consobrinus*



WESTERN SWIFT, *Sceloporus biserialis*

The additional tail on this specimen is an irregularity resulting from an injury to the original member



COLLARED SWIFT, *Sceloporus forquatus poinsettii*

The finest species of its genus. Attains a length of 10 inches. May be recognised by the extremely coarse scales and broad black collar

The Swifts

Sub-division II. *Internal border of small scales, extending completely about the margin of supraorbital crescent.* Sometimes an additional, but fragmental, external border.

Gray, with wavy black cross-bands; an oblong, black patch on each shoulder; a broad, pale band on each side; size large; scales coarsely bristling. SPINY SWIFT, *S. spinosus*.

Division B. A row of large, supraocular plates, with a single internal border and *two* external rows of small scales. Larger head plates smooth.

Colour phases.—Grayish or olive with wavy, dark cross-bands. Usually a plate band (or two) on each side.

Sub-division I. *Traces of black collar on sides of neck.*

Bluish-black; a greenish or yellow spot in each scale; a broad black collar on sides of neck. Size large. YARROW'S SWIFT, *S. yarrowii*.

Sub-division II. *No collar. Pale bands on sides.*

Greenish-gray, with two series of narrow dark blotches (wavy) on back. Size moderate.* Bands on sides obscure or lacking.

WESTERN SWIFT, *S. biserialus*.

Dark green, with faint traces of a pale band on each side. Scalation rather fine; size small; apparently confined to southern California and Lower California.

VAN DENBURGH'S SWIFT, *S. vandenburgianus*.

Greenish-yellow, with obscure cross-bands; a very distinct, pale band, on each side; scales moderately coarse; size small.

YELLOW-BANDED SWIFT,
S. undulatus var. *consobrinus*.

Division C. Very similar to Div. B. in arrangement of the supraocular plates; *but the larger plates of the head are wrinkled longitudinally (rugose).* There are occasionally *three* external borders of small, supraorbital scales.

Colour phases.—Grayish, with darker cross-bands. No collar. Pale bands on sides.

* Species of this genus that attain an average length of nine inches, may be termed *large* species; those reaching an average length of seven inches may be considered as of *moderate* size, while species growing to a maximum length of about five inches are designated as the *small* members of *Sceloporus*.

The Swifts

Large supraocular plates numerous—six; marginal scales numerous and minute; dark green, with a pale, greenish band on each side—these separated by about fourteen rows of scales; two series of obscure blotches; size large.

VARIABLE SWIFT, *S. variabilis*.

Gray, with wavy, darker cross-bands. An indistinct stripe on each side—these separated by about ten rows of scales. Size small. Head plates not always corrugated. Occurs from Atlantic to Pacific Coasts.

COMMON SWIFT, *S. undulatus*.

Scales more bristling than preceding; blotches rather triangular. Occurs on the Pacific coast only; size small.

PACIFIC SWIFT, *S. undulatus*, var. *occidentalis*.

Pale bands separated by six or eight rows of scales; otherwise very similar to *S. undulatus*. Size small. Restricted to Texas.

THAYER'S SWIFT, *S. thayeri*.

Olive-gray; a very narrow, but bright yellow line on each side—these lines about twelve scale rows apart. Two series of dark crescents on back; size small.

STRIPED SWIFT, *S. scalaris*.

Division D. *A double series of moderate-sized, supraocular plates*, bordered internally with a row of smaller scales and externally by one or two rows of small scales—which latter rows may be of irregular formation.

Sub-division I. *A broad, jet-black collar, completed above.*

Scales very large and bristling. Obscure, dark cross-bands on olive ground; a broad, black collar, margined with yellow and *completed above*. Size very large.

COLLARED SWIFT, *S. torquatus*, var. *poinsettii*.

Sub-division II. *No collar; pale bands on sides.*

Olive gray. A pale band on each side, about two scales wide and separated by about eight scale rows. Obscure cross-bands. Size moderate.

SAGE-BRUSH SWIFT, *S. graciosus*.

Following is a descriptive list of the species:

The first group of the Spiny Swifts to be considered, is Division A of the key, with which the inner border or margin of small scales along the edges of the supraocular plates is in-

The Swifts

complete—extending only about two-thirds around the crescent-shaped margin—the rear supraoculars being in contact with the larger plates of the head. There is a single outer margin of small scales. The colouration of the members of this group is in no way characteristic.

Clark's Swift, *Sceloporus clarkii*, (Baird & Girard), is a fine species, with large, sharply pointed, bristling scales. It is rather characteristic from the large and very regular scalation of the head, the shields being so sharply outlined that the scale formula may be noted by the novice without the least difficulty.

Each body scale contains a greenish or bluish patch and is usually edged with gray. The spots within the scales vary greatly in intensity according to the activity of the individual. If the lizard is active the greenish spots assume such decided hues that the entire body appears to be of a greenish or bluish tinge. If it is sluggish, the gray edges of the scales suffuse the brighter colours and the prevailing hue is dull gray. On some specimens there is a series of dull, wavy cross-bars of a dark hue on the back; others have no trace of these, but on all there are indications of a broad, black collar on the sides of the neck; this is not margined with a lighter colour, nor is it visible from above. The under-side of male specimens is dull white, with a patch of vivid blue on each side of the abdomen and a similar patch on the chin.

Dimensions.—Following are the measurements of a specimen taken near Tucson, Arizona:

Total Length	9	inches.
Length of Tail	5	"
Width of Body	1 $\frac{3}{8}$	"
Width of Head	1	"

Distribution.—Inhabits the deserts and sub-arid regions of the southwestern United States. It occurs in southern California and in Arizona generally, New Mexico, southern Nevada, southwest Utah and northern Mexico.

Habits.—Although an abundant lizard, it is difficult to capture. It skims over the desert soil if pursued, and, if deciding to stop for a moment to reconnoitre, will actually slide a few inches from the great momentum of its scampering pace. If near a "pole" cactus or a yucca tree, it darts upward at a

The Swifts

bewildering speed. The collector stands about as much chance of catching specimens with his hands alone—possibly assisted by a net—as he would if trying to collect birds in such primitive fashion. The up-to-date collector who is after such specimens, to preserve them, carries a small-bore shot gun and shells loaded with very fine shot.

This swift seems to be particularly abundant about Tucson, Arizona. A collector sent the following, in a letter to the writer:

“I have been after those big swifts for some time, but would rather catch rattlers. Not that the latter job is the most pleasant, but the trouble expended is well repaid by the character of the specimens captured. Although these swifts are common enough, there is generally about as much labour and excitement in catching a few as rounding up a bunch of wild steers. If you do get near enough to make a grab, the brute seems determined to make your efforts as fruitless as possible, by twisting off most of its tail. They can run up the yuccas a great deal faster than a squirrel can get up a tree. I am sending you four—*all without tails*.”

The tailless specimens arrived safely in New York and were placed in a cage at a south window. Here they obtained sunlight for the greater part of the day. On cloudy days, or during the early morning before the sun shone into their cage, they were dull and sluggish, either lying flattened against a log or clinging in the dark corners. As the first few inches of sunshine crept into the cage, they took immediate advantage of it, first basking, so as to thoroughly warm their bodies, then beginning to frisk about in the liveliest fashion. Their sombre gray tints of the early morning changed to a rich, greenish hue, or, if one of the males became greatly excited after being chased about the cage by one of his sex, the green gave way to a profuse sprinkling of pale blue over the back and tail, while a broad band of jet-black appeared on each side of the neck as indications of the broad collar to be seen on several of the larger species of swifts. At such times, when the head was raised, the vivid blue patches on the chins of the males were strikingly brilliant. These blotches appeared to vary almost momentarily from the richest emerald green to a light purple, thence to a pale, sky blue. As the sun crept out of the cage again, these creatures of the light once more retired to the log and the dark corners, to flatten, with eyes half closed and colours fading into dull gray hues. Apparently the sun was half their life. They fed

only during the hours of the brightest light and highest temperature, taking mealworms, grasshoppers and various caterpillars, shaking the larger ones violently, in much the same fashion as a terrier treats a rat. They could not be induced to feed on cloudy days, even though the temperature was high.

About two months after the arrival of these specimens, each of them exhibited about a quarter of an inch of a new tail, growing from the broken stump of the original member. This second tail grew slowly. On one specimen it attained a length of about two inches, but on the others grew to lesser proportions, though all were large—nearly four inches long in combined length of head and body. Eight months after their arrival, no further growth could be noted. The new tails were abruptly pointed and covered with a different and much finer scalation than the lost appendage. These lizards passed the winter in a well-heated room at a sunny, south window, and were fully as active during the cold months as in the summer. They lived for several years.

The **Banded Swift**, *Sceloporus zosteromus*, (Cope), is one of the three species of the former portion of Division A in the key. Occasional specimens exhibit *two* external rows of small, supra-ocular scales. The scales of the body are large, keeled and bristling. It is one of the largest species of the genus, attaining a combined length of head and body, of $3\frac{1}{2}$ inches.

Ground colour olive; a broad, reddish band on each side of the back. On some specimens there are narrow, dusky cross-bands. Throat and abdomen tinged with bright green or blue.

Distribution.—The Peninsula of Lower California.

Orcutt's Swift, *Sceloporus orcuttii*, (Stejneger), is another species of Division A, and readily distinguished by its smooth scales, which are large and terminate in a sharp point. This lizard grows to a length of over eight inches; with a specimen $8\frac{3}{4}$ inches long, the combined length of the head and body would be about $3\frac{1}{2}$ inches. There are a series of enlarged scales immediately in front of the ear opening.

In its colouration this is one of the most striking of the swifts. The ground colour of adult specimens is brownish upon the back and blackish upon the sides, although little of this ground colour is apparent, owing to the remarkable spots and blotches upon the scales. The scales of the back have a bright,

The Swifts

bluish spot at their base and are tinged with red at their margin. Those of the sides are more finely spotted (speckled) with these colours. The limbs and tail are usually of a rich, blue tint. Altogether the effect is that of a stained glass window, in miniature. The greater portion of the abdomen is greenish-blue.

Distribution.—Mountain regions near the coast of southwestern California.

Sub-division II of the first group of Spiny Swifts, contains but one species (north of Mexico). It differs from the preceding in having the inner margin of small scales completely bordering the crescentic margin of the supraocular plates. There is a single row of external scales with the majority; occasional specimens have fragmental indications of a second row.

The **Spiny Swift**, *Sceloporus spinosus*, (Wiegmann), is one of the large species. The scales are large, strongly keeled and terminate in very pronounced, spiny points, presenting a decidedly bristling aspect.

Dull olive or grayish, sometimes greenish or yellow; a series of narrow, wavy, black cross-bands on the back, continued in closer formation on the tail, in ring-like fashion. On each side of the back, but particularly distinct upon the shoulders, is a pale band, the width of a single row of scales and a half row on each side. Male specimens have a large, oblong, black patch near the region of each shoulder. The abdomen of the male is marked on each side with a large purple blotch, margined with black; little or no blue on the under surface of the female, and on neither sex is there an indication of a black collar.

<i>Dimensions</i> .—Total Length	9½ inches.
Length of Tail	5½ "
Width of Body	1½ "
Width of Head	1 "

Distribution.—Abundant in Mexico and extending northward, and commonly, throughout western Texas and New Mexico. As far east as Dallas it becomes rare, but the distribution in the United States is continued eastward to Pensacola, Florida.

Habits.—The Spiny Swift lives most frequently upon the trunks of trees, mostly on fallen timber, over which it runs with an amazing show of speed. Friends of the writer, who have collected the species in Mexico, tell him that it ascends the trunks of trees with a great alacrity until a short distance over

one's head, when it dodges from one side of the trunk to the other as the observer is trying to locate the reptile, keeping out of the line of vision in the same fashion as a squirrel. Like many of the swifts, these lizards often burrow in the sand at the bases of the trees, to pass the night. In this habit they resemble the horned lizards (*Phrynosoma*). The majority of captives, if kept in a cage with a few inches of gravel, burrow just deep enough to cover the back, beginning this operation as the afternoon sun leaves their cage.

Group B.—We now arrive at the second group of the Spiny Swifts. There is a single row of large, supraocular plates, with a single internal border and *two external borders* of small scales. The species are of fair or moderate size.

Yarrow's Swift, *Sceloporus yarrowii*, (Cope), is one of the handsomest of the genus. Above it is a dark, rich purple, or bluish-black—the sides and limbs distinctly bluish. Each of the scales of the upper surface contains a pale greenish or yellowish spot. There is a broad, black collar on the sides of the neck, bordered by a pale hue. Behind this collar is a V-shaped band of black, extending over the shoulders. The chin and sides of the abdomen are blotched with blue. Dr. Stejneger explains that specimens of this lizard, when sluggish, will assume an almost blackish hue that is quite uniform.

The species attains a length of 8 inches. The scales are weakly keeled and not so bristling as with others of the genus.

Distributions.—Fairly abundant in the southern portions of Arizona, whence it appears to range a short distance into Mexico. It lives among rocks and takes refuge in fissures when pursued.

The *Western Swift*, *Sceloporus biserialis*, (Hallowell). This is the commonest and most widely distributed of the Western species. It is of moderate size. The scales are proportionately small, and the scalation, will, at a glance, appear considerably finer and smoother than many other *Scelopori*.

The usual ground colour is light, greenish-gray. There are no indications of a collar. Across the back are two series of distinct, narrow and wavy bars. These are blackish and narrowly margined in the rear with a much paler hue than the ground colour. The sides of the abdomen and chin of the males are blue—on very old specimens, blackish.

The Swifts

The species somewhat resembles the common swift (*S. undulatus*), but differs in reaching a third larger size, having proportionately smaller and smoother scales and *much longer limbs*. The specimen photographed was remarkable in having two tails.

Dimensions.—Total Length 6 $\frac{1}{4}$ inches.
Length of Tail 3 $\frac{1}{4}$ "
Width of Head $\frac{1}{4}$ "
(Not fully grown)

Distribution.—The Great Basin and the mountain ranges of the Pacific region from Oregon to San Diego County, California, inclusive of both.

Habits.—Mr. D. D. Streeter informs me that he observed many specimens of this lizard on the ground, in rocky districts. They rushed away with great speed when alarmed, making for the clefts under shelving rocks where they invariably defied capture.

Van Denburgh's Swift, *Sceloporus vandenburgianus*, (Cope), grows to a length of only five inches. The scales are proportionately small.

Dark green above, with faint traces of a pale band on each side, and obscure, darker cross-bands on the back. The greater portion of the under surface of the male is blue.

Distribution.—This seems to be a rare swift and confined to southern California.

The **Yellow-striped Swift**, *Sceloporus undulatus*, variety *consobrinus*, (Baird & Girard). A variety of the common swift and abundant in many portions of the Western States and in northern Mexico. The very distinct stripes, of a pale hue, on the sides, render it rather characteristic. The scales are small and not heavily keeled, although their spiny tips are rather bristling. It represents one of the smaller species.

The commonest phase of ground colour is greenish-yellow. On each side of the back are two very distinct and narrow yellow stripes—the upper the most vivid, covering a width of two and a half rows of scales and separated from its fellow by about eight scale rows. On many specimens there is a dusky band between the stripes, on the sides. There are usually but slight indications of cross-markings and these are very fine.

The Swifts

<i>Dimensions.</i> —Total Length	5	inches.
Length of Tail	2½	"
Width of Body	¾	"
Width of Head	½	"

Distribution.—The Yellow-striped Swift is widely distributed. It occurs all over Texas and extends northward into Nebraska, southward well into Mexico and westward into Utah, Nevada and California.

Group C.—The species of group C are very similar to those of the preceding division and might appropriately be included within it, but usually exhibit a wrinkling of the larger head plates, which are corrugated in a longitudinal direction. With a genus like the present one, beset with difficulties for the beginner, we must take advantage of even such slight characters to assist in unravelling the general tangle. The members of this group show no trace of a black collar.

The **Variable Swift**, *Sceloporus variabilis*, (Wiegmann), has acquired its name from the difference in colouration between the male and the female. The large supraocular plates are numerous and narrow; they are bordered externally by two rows of very small, almost granular scales. *The larger head plates are strongly wrinkled—rugose.* The scales of the body are proportionately small.

Olive, or dark green, with a pale, greenish band on each side; two rows of blackish spots on the back. The pale bands are separated by about fourteen rows of scales.

Male specimens have an elongated, black ellipse on each side of the abdomen and a blackish band beneath the stripes on the side. The females lack the abdominal black marking and the dark band on the side as well. The species attains a moderate size.

Distribution.—In the United States this swift seems to be confined to Texas; in that state it occurs as far north as San Antonio. It is common in the eastern portions of Mexico.

The **Common Swift**, *Sceloporus undulatus*, (Latrielle), one of the smaller species. The scales are of moderate size, well-keeled and moderately bristling; most specimens have the head scales strongly wrinkled—rugose.

Gray, sometimes brown or greenish, with narrow and wavy black cross-bands on the back—often in the shape of irregular

The Swifts

V's. On each side of the back is an indistinct, paler band; these bands are about ten rows of scales apart.

The males have a black blotch under the chin, enclosing more or less blue, also two large, bluish patches on the abdomen. There is little or no blue on the underside of the female.

Illustrated.

Dimensions.—The measurements represent the average-sized specimen:

Total Length	5 $\frac{1}{2}$ inches.
Length of Tail	2 $\frac{7}{8}$ "
Width of Body	$\frac{3}{4}$ "
Width of Head	1 $\frac{9}{16}$ "

Distribution.—The typical form occurs abundantly from the Atlantic to the Pacific coasts, from about the latitude of southern New Jersey, southward; in the extreme West it ranges as far north as Oregon.

Habits.—It is in the dry and sandy pinelands of the southeastern United States that this sombre little lizard is found in the greatest numbers. The writer has taken many dozens of specimens in the coast regions of South Carolina and Georgia; they show a marked preference for the fallen pines or sections of cut timber, as about such trunks, with their loosening bark, insect life is more numerous than on the living trees. We took the largest numbers of specimens in the saw-mill yards, for the swifts were always abundant on the piles of logs. Few specimens were observed running up the living trees and these were usually lizards that had been frightened from derelict timber and taken to the tree in flight. Their movements upon a large, fallen tree trunk, were very amusing. When approached they would dart to the opposite side of the trunk to that upon which one was approaching. As the collector's body loomed over the trunk the lizard would shift its position until it was directly beneath. If every movement of one's approach were slow and cautious, capture was comparatively simple, for all to be done was to make a rapid grab with the hand on the opposite side of the log from that on which the bulk of the collector's body appeared. But alas! This grab could not be regulated to the nicety as if you were actually looking at your object, and, although the hand approached with lightning-like rapidity, the lizard started away from it at the same rate. The result was, in many cases,

that you did grasp the creature, but by the tail. A second later a dark object scurries over the sand in direct line for a tree, and up it darts, while you ruefully examine a wriggling tail from which the original owner has twisted itself free.

The writer remembers a section in Fairfax County, Virginia, that teemed with these reptiles. They were especially abundant upon an old rail fence that ran a mile or more around a pasture. The stiles of the fence were old and weather-stained and the lizards were in perfect harmony, in their dull, gray tints, with their surroundings. These specimens were not readily captured. They appeared to realise the opportunities of escape offered by the lengthy span of fence. If approached they darted to the opposite side of the fence-rail, then ran for fifty feet or more along the fence, finally peering over to the side of the pursuer, but, if finding him nearby, repeating the performance.

There was another family of lizards living on the rough stonework of the bridge over Bull Run Creek, in Virginia, and these were more elusive than the former specimens for they darted in and out of the crevices between the masonry in a fashion that made capture impossible.

Captive specimens remain quite timid, but they are hardy and will live for years. They require an abundance of sunlight and a perfectly dry cage. The food should be mealworms and other soft-bodied insects.

The eggs of this species are from three-eighths of an inch to half an inch in length, according to the size of the female. They are oval and covered with a very thin, papery shell; it is indented upon the slightest pressure of the fingers. The eggs may be hatched by placing them in moderately damp—not soggy—*sphagnum* moss, and keeping them in an ordinary room temperature, where their period of incubation is from six to eight weeks.

The **Pacific Swift**, *Sceloporus undulatus*, variety *occidentalis*, (Baird), differs from the typical form in having more bristling scales, while the V-shaped blotches of the back are almost solidly black, thus appearing as dark triangles. This form is confined to the Pacific coast region.

Thayer's Swift, *Sceloporus thayeri*, (Baird & Girard), seems to be closely allied to the preceding, but the pale bands—one on each side of the back—are nearer together, or about 6 to 8

The Swifts

scale rows apart, while male specimens have two bluish patches on the throat in place of one, as is usually the case with the common species. *Moreover, the abdominal plates of this lizard are keeled;* in this character it is unique among all the species of the genus. It is of small size.

Distribution.—Apparently restricted to southwestern Texas.

The **Striped Swift**, *Sceloporus scalaris*, (Wiegmann), should be enumerated among the moderate-sized species. The head plates are strongly wrinkled and the scales of the body are small, narrow and sharply pointed.

Olive gray, with a very narrow, but vividly defined stripe of yellow or white on each side of the back, *extending along the centre of a single row of scales.* These stripes are separated by about six or seven scale rows. Two rows of dusky crescents on the back.

Resembles the sage-brush swift, (*S. graciosus*), of Division D, and several other species that have pronounced, pale bands on either side of the back, but may be distinguished by the very narrow bands, traversing the centre only, of a *single* row of scales. On the other species the bands either cover the entire width of a single row of scales, or embrace a half row of scales each side of the former. The width between these bands (number of scale rows) is also an important point to be used in determination.

The Striped Swift has a round, and jet black spot at the base of the forelimb.

Distribution.—Southern Arizona and Mexico generally.

Division D.—In the fourth group of those species of Spiny Swifts that occur within the limits of the United States, we have our largest and most showy species and one other, of considerably smaller size. With these two species there are *two rows* of the large, supraocular plates over each eye, bordered internally by a single row of smaller scales and externally by one or two rows.

The **Collared Swift**, *Sceloporus torquatus*, variety *poinsettii*, (Baird & Girard), is a northerly phase of a Mexican species. It is characterised by a broad, jet-black collar, bordered on each side with yellow and *extending entirely around the upper surface of the neck.*

The general proportions of this fine swift are illustrated by

The Swifts

the photo of an adult specimen upon a man's hand. The form is stout and heavy, the tail short and blunt, while the scales are exceedingly coarse, with needle-like bristling points, a character as pronounced on the tail as the formation of the spinous stalks of many plants. When the scales are examined individually, they appear like feathers—being sharply serrated along their edges.

The colouration of the body is dull olive, brown or gray, with indistinct and wavy cross-bands on the back, at a considerable distance apart. Around the neck is a broad, jet-black collar, bordered on either side with yellow. The chin of male specimens is blue and there is a bluish patch on each side of the abdomen. From the other species of swifts occurring within the United States and showing traces of a black collar, this lizard may be told by the collar being complete above.

<i>Dimensions.</i> —Total Length	9½	inches.
Length of Tail	4½	"
Diameter of Tail, at base	7⁄8	"
Width of Body	1¾	"
Width of Head	1½	"

Distribution.—Southern Arizona, New Mexico, southwestern Texas and northern Mexico. Dwells principally in rocky places.

The **Sage-brush Swift**, *Sceloporus graciosus*, (Baird & Girard), differs from the preceding not only in its considerably smaller size, but in colouration. The scalation of the head is quite similar, but the scales of the body are proportionately small. The ground colour is brown or olive. On each side are two distinct, yellow stripes, these enclosing a dusky band. On each side of the back is a series of dark and narrow crescents. Between the stripes on the sides, is another series, of similar size. All of these crescents are bordered at their rear with yellow, this hue greatly accentuating their outline. In front of the forelimb and almost in contact with its base, is a round, black spot. The abdomen of male specimens is marked with two blue blotches and the chin is tinted with the same colour.

Resembles the striped swift (*S. scalaris*), but may be at once separated by the scale formula of the head and the smoothness of the larger head plates.

The Swifts

Distribution.—Abundant in the Great Basin. It occurs as far north as Oregon and is common in the mountains of eastern California, Idaho, Nevada and Utah to an altitude of 8,000 feet; most abundant on the sage-covered plateaus. Southward it extends through the deserts, into northern Mexico.

Regarding identification.—At no part of this chapter has the writer gone into elaborate details concerning the possible necessity of a distinct, varietal name for certain variations, or combating the validity of some species that bear a close resemblance to others. Before commencing the chapter, he examined a large series of specimens and compared the various species with the technical descriptions in the regular works of scientific nomenclature. His decisions resulted at the time, in omitting certain alleged species that he did not consider strong and distinct. That part of the work was then looked upon as a closed chapter, and it is not the writer's idea to burden the student with long explanations as to how he arrived upon the list of species as they stand. The point has been to treat a very confusing genus in a manner that will present it to the student from the standpoint of a bird's-eye view. The genus *Sceloporus* is worthy of an elaborate monograph, but the proper compilation of this would take half a lifetime and study of the combined collections in the museums of the world—besides many additional specimens to solve certain problems now standing.

In comparing specimens of *Sceloporus* the student should count the scale rows, note the proportionate size of the body scales, study the head plates and compare the colouration of one series with another. The locality is also an important factor and will aid in the case of old specimens of exceedingly brilliant colours, as the dots and splashes of brilliant hues will fit into none of the descriptions. An occasional specimen will exhibit a head scalation that seems to be outside the definitions of all the divisions. In such a case, *locality* counts and helps in removing the puzzling individual from its indefinite status.

CHAPTER XVII: THE HORNED LIZARDS

GENUS PHRYNOSOMA

A Genus of Lizards that are Most Commonly Known as the Horned "Toads"

FROM all the other genera of the North American Lizards, the Horned Toads are very distinct. Their very wide, much-flattened and toad-like bodies, the short tail and the development among most of the species of sharp, conical horns upon the back of the head and the temples are unique characters. The scalation is also peculiar, as the back is covered with minute, granular soles, among which rise, almost vertically—greatly enlarged and sharply-pointed scales, which are imbedded like miniature pyramids at their bases. Altogether, these lizards are so spiny in their general make-up as to appear quite formidable to the observer uninitiated in their habits.

The Horned Lizards are found only in the western portions of the United States and in Mexico. The number of species generally recognised is 17, of which 4 are exclusively Mexican. Several other species occur commonly in Mexico and range but a very short distance northward over the boundary line of the United States.

Owing to the fact that the ear drum of several species is covered with a thin skin studded with minute scales, certain writers have seen fit to place these in a separate genus—*Anola*. This character appeals to the writer as too superficial for the division of these peculiar lizards into two genera and he has decided to include them all under the head of *Phrynosoma*.

In studying the species of this genus, the following characters should be observed. (1) The formations and proportionate length of the head spines. (2) The character of the spines upon the back and whether these are surrounded by a rosette of smaller spines, at their bases. (3) The character and number of rows (whether one or two) of fringes of spiny scales

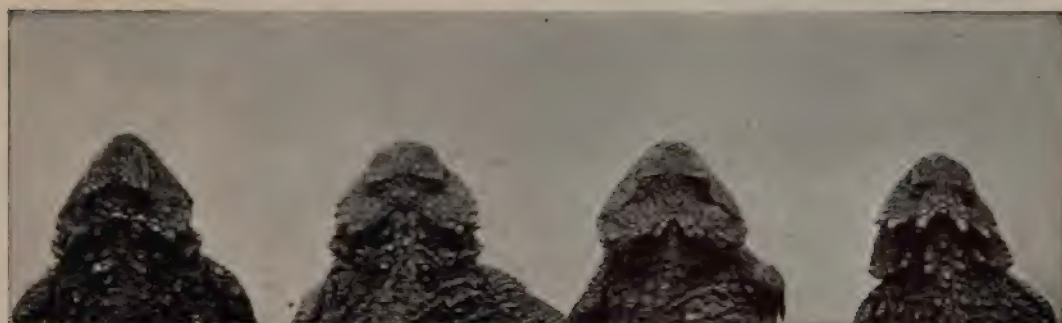
The Horned Lizards

along the edge of the body. (4) Whether the scales of the abdomen are smooth or keeled. (5) The arrangement (if any) of enlarged scales upon the chin. This latter character is a valuable one.

Habits.—Unlike the vast majority of lizards, the Horned "Toads" are viviparous—producing living young and to the number of from six to a dozen. The young are born in the same fashion as the viviparous snakes. They are encased in a transparent envelope through which they soon break. They are at once active and fully able to care for themselves. At birth they possess rudimentary horns and do not exhibit the rough, spiny appearance of the parent. In an illustration accompanying this chapter the size of the newly born young may be compared to that of the parent.

The Horned Lizards are creatures of hot and dry, sandy or sub-arid situations. Many of the species inhabit the deserts proper where the sun, beating without obstruction upon ground destitute of moisture, produces a heat practically unendurable to the human. In these burning, silent and desolate wastes of the Southwest, the little waifs of the sand dart here and there with wonderful rapidity, subsisting entirely upon insect life. It is during that part of the day when the sun is at its highest that they display the most vivacity. Long before the sunset, while the heat waves yet quiver upward from the bleached soil, they prepare themselves for the night. This is a curious process. The little creature imbeds its nose in the sand like the blade of a plow, when it quickly works its way forward a few inches, scooping vigorously with the head in order to produce a furrow. Thus having worked its way a little distance into the sand it flattens the body and employing the sharp, spiny borders of its sides in shovel-like fashion, digs its way deeper and casts the sand over its back. The head is again employed, then the sides again and finally the queer little reptile is entirely covered. Sometimes it digs its way some two or three inches beneath the surface. At other times—and more frequently—the back is covered but the top of the head is visible and just level with the surface of the sand.

In several ways these reptiles are so toad-like that the original and popular name may be readily appreciated. The method of eating is much like that of the toad, a condition strengthened



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HEADS OF HORNED LIZARDS, *Phrynosoma*

- 1, 5 Hernandez's Horned Lizard, *P. douglassii hernandesi*.
 2, 6 Douglass's Horned Lizard, *P. douglassii* (typical).
 3, 7 Ditmars's Horned Lizard, *P. ditmarsii*.
 4, 8 Mexican Horned Lizard, *P. orbiculare*.

- 9, 13 Texas Horned Lizard, *P. cornutum*.
 10, 14 Ashy Horned Lizard, *P. calidiarum*.
 11, 15 Regal Horned Lizard, *P. regale*.
 12, 16 Pacific Horned Lizard, *P. coronatum*.



DOUGLASS'S HORNED LIZARD, *Phrynosoma douglassii*
The horns are reduced to mere tubercles. Inhabits the northern Pacific region



PAINTED HORNED LIZARD, *P. douglassii ornaticinctum*
This desert variety shows in its markings remarkable similarity to the soil



HERNANDEZ'S HORNED LIZARD, *P. douglassii hernandesi*
On this variety the horns are much more developed than with the typical form. Common in the Western Plains region

by the character of the tongue. The Horned Lizards do not procure their prey by a scampering rush as do the majority of the North American lacertilians. In coming in close proximity to the food, the head is bent deliberately, the thick, viscid tongue is quickly protruded and like a flash the morsel has disappeared within the lizard's mouth. Although these actions are very toad-like, all similarity to the movements of the batrachian may a few seconds later be dispelled, when the lizard, taking fright, darts away with the speed of a startled mouse.

If caught and handled, the average horned "toad" is rather a spiritless creature. It seldom attempts to bite, although it may vigorously employ the spines of the head in an endeavour to produce injury which is quite impossible, beyond a superficial scratch. The average specimen shuts its eyes and feigns a state of indifference, or death. Some specimens puff up prodigiously, while others perform to the extreme reverse, flattening the body to such an extent that they seem devoid of internal organs. Occasional specimens, when handled, exhibit a remarkable habit. This consists of the ejection of jets of blood from the corner of the eye. It was after examining several hundred specimens, that the writer's inclination to become sceptical about the alleged habit suddenly received a startling reverse. He received an unusually large and fat specimen of a Mexican species—*Phrynosoma orbiculare*, of a rich, reddish hue—almost a crimson. After photographing the specimen, it was measured. The latter process seemed to greatly excite the creature. It finally threw the head slightly upward, the neck became rigid, the eyes bulged from the sockets, *when there was a distinct sound* like that produced if one presses the tongue against the roof of the mouth and forces a small quantity of air forward. This rasping sound, consuming but the fraction of a second, was accompanied by a jet of blood at great pressure. It hit the wall, four feet away, at the same level as that of the reptile. The duration of the flow of blood appeared to be about one and a half seconds and toward its termination the force gradually diminished, as noted by a course of drops down the wall and along the floor to a position almost under the spot where the reptile had been held. The stream of blood seemed to be as fine as a horse-hair and to issue from the eye-lid, which was momentarily much swollen. For some time after the performance the eyes were tightly closed

The Horned Lizards

and nothing could induce the lizard to open them. Within two minutes after it was placed on the ground the protruding aspect of the eye-balls and the swelling of the eye-lids had disappeared.

Most surprising was the amount of blood expended. The wall and floor showed a course of thickly-sprinkled spots about one eighth of an inch in diameter. *There were 103 of these spots.*

In captivity the Horned Lizards are highly interesting and will long survive if properly cared for. They require a screen cage, of fair dimensions, with several inches of fine sand (building sand) and must be kept dry and very warm. A flood of sunshine, for the greater part of the day, is absolutely necessary to keep them in good health and feeding. Without the sun they exhibit a general lassitude and feed indifferently. Water should be given them in very shallow dishes, sunk in the sand, but care should be taken in filling these that the sand itself is not moistened. Mealworms, which may be obtained at any bird store, form a good food, but specimens are also fond of ants, small, soft-bodied grubs, roaches, grasshoppers and crickets. They will not eat earthworms.

A key to the genus follows:

Division I. *Head spines rudimentary or small*—represented by mere tubercular scales, or spines that are little longer than the horizontal diameter of eye-opening.

Area inside of the two large rows of plates on chin, composed of small, *uniform* scales.

a. *Ear drum exposed.*

† A *single* row of spiny, marginal scales on body.

Head spines reduced to tubercles, or with some varieties, spines that are shorter than the diameter of the eye.

DOUGLASS'S HORNED "TOAD," *P. douglassii*—and varieties.
Central head spines about equal in length to the horizontal diameter of eye-opening.

MEXICAN HORNED "TOAD," *P. orbiculare*.

†† No fringe of spiny scales on sides.

Central head spines about length of diameter of eye-opening. Abdominal scales smooth.

LITTLE HORNED "TOAD," *P. modestum*.

No head spines. Head very wide and flat at the temples, with ridges forming crown-like process above. Abdominal scales keeled.

DITMARS'S HORNED "TOAD," *P. ditmarsii*.

The Horned Lizards

b. *Ear drum covered with granular scales.*

Head spines rudimentary. Body spines little developed.

Colour pinkish or dull red.

SMOOTH HORNED "TOAD," *P. platyrhinum*.

Division II. *Head spines well developed.*

a. *Ear drum covered with granular scales.*

† A single series of marginal, spiny scales.

Size rather small; head proportionately small, with large, central spines directed upward.

ASHY HORNED "TOAD," *P. calidarium*.

†† *Two series of marginal spiny scales*, the lower but slightly developed.

Head spines moderate. No enlarged scales on central portion of chin.

GOODE'S HORNED "TOAD," *P. goodei*.

Head spines large. Two rows of slightly enlarged scales on central portion of chin.

MACCALL'S HORNED "TOAD," *P. maccallii*.

b. *Ear drum exposed.*

* A row of large, projecting plates beneath each series of lower labials, and between these, *two double rows or triple rows of enlarged scales.*

Head spines large, of regular arrangement.

One series of marginal spines.

CERROS ISLAND HORNED "TOAD," *P. cerroense*.

Head spines large, of regular arrangement. Body spines very bristling. *Two series of marginal spines, of equal length.*

PACIFIC HORNED "TOAD," *P. coronatum*.

Four large central horns and three upon each temple, forming a perfect circlet or crown upon the rear of head. One large and one very small series of marginal, spiny scales on sides of body.

REGAL HORNED "TOAD," *P. regale*.

**A row of large, projecting plates beneath each series of lower labials; between these, *two single rows of enlarged scales.*

Two large, central head spines, directed upward; three temporal spines.

TEXAS HORNED "TOAD," *P. cornutum*.

Concerning a name.—Thus far, in this chapter, the writer has used freely the name "*horned toad*," but he realises how inappropriate is that appellation in connection with a genus of lizards. However, he feels, that to introduce the beginner to any group of reptiles, it is best to employ a well-known, popular title at the start. Now that we understand our subjects, let us

The Horned Lizards

altogether drop this misleading title and call these creatures the horned *lizards*, as they literally are. Among the batrachians there are actually a number of species of horned toads—*true horned toads*. The South American genus *Ceratophrys* furnishes startling examples in size and grotesque development. Thus we can understand why the name “horned toads,” if applied to the present genus of lizards, might be very misleading to a general naturalist.

A descriptive list of the *Horned Lizards* follows:

DOUGLASS'S HORNED LIZARD

Phrynosoma douglassii, (Bell)

Of the first group comprising the greater portion of this genus—the members possessing an exposed ear drum—Douglass's Horned Lizard exhibits the most rudimentary horns. Three phases of this species may be recognised. With the typical form and one of the varieties, the horns are reduced to mere tubercles. The third phase has very short horns—shorter than the horizontal diameter of the eye. The limbs are proportionately shorter than of the other horned lizards.

As the accompanying illustrations very clearly delineate the various characters of the three phases, elaborate details would be superfluous.

These points distinguish the three varieties; all of which have *smooth* abdominal scales, and small, equal-sized scales upon the chin:

Size small, limbs short. Horns reduced to tubercles.

Snout very blunt.

DOUGLASS'S HORNED LIZARD, *P. douglassii*, typical, Bell.

Length of adult.—4¾ inches.

Distribution.—The northern and Pacific district including the slopes of the Sierra Nevada Range. Size moderate. Horns more developed, although of tubercular form. Pattern vivid. Snout more pointed.

ORNATE HORNED LIZARD, *P. douglassii*, variety *ornatissimum*, Girard.

Length of adult.—5½ inches.

Distribution.—Desert regions and dry plateaus east of the Sierra Nevada Range, from Canada to Mexico.



DITMARS'S HORNED LIZARD, *Phrynosoma ditmarsii*

The horns are reduced to tubercles and the back lacks the spiny aspect of most of the species. Has been found in northern Sonora, Mexico



MEXICAN HORNED LIZARD, *Phrynosoma orbiculare*

A large Mexican species. Most examples are of a dull red hue



REGAL HORNED LIZARD, *Phrynosoma regale*

A showy species of the southwestern deserts. The only member of its genus having four central occipital horns. These and the temporal horns produce the effect of a circlet or crown. The horns are often pinkish



PACIFIC HORNED LIZARD, *Phrynosoma coronatum*

Most nearly allied to the Regal Horned Lizard, but differing in the more elongate body, the thicker and longer tail, and in having only two occipital horns. Inhabits southern California and Lower California

The Horned Lizards

Size moderate. Ears more developed and nearly as long as the horizontal diameter of the eye.

BERNARDINO & HORNED LIZARD, *P. inaequalis*, variety *torquatus*, Girard.

Length of adult.—5 inches.

Distribution.—The Great Plains and Rocky Mountain district generally—in abundant form.

This species is interesting in demonstrating, in all its phases, the remarkable similarity of the colour of individuals to the soil on which they live. It is illustrated to an extraordinary degree with specimens found in areas where the soil is of an unusual shade. Several specimens of the desert form *ornatissimus* collected for the writer were examined with surprise: they were distinctly pink, with white spots. A letter received from the collector contained the following explanation: "The horned lizards sent you were taken in a region where the soil was pinkish, scattered with fine white pebbles. They were very difficult to see, unless moving. Dr. Stejneger described specimens of the typical form from the San Francisco Mountains, that exactly match in their ground colour the soil and rocks, while their paler markings are perfect imitations of the lichens covering the rocks. He further explains that even more remarkable are the specimens collected by Dr. Merriam in a black lava belt. These specimens were satiny black, with rich, yellow markings—even the gloss of the lava was imitated. A female specimen of this phase and her young are figured in an accompanying photograph.

Through the courtesy of C. D. Streeter, Jr., the writer has received a number of living female specimens of the variety *bernardini*, from Wyoming. This afforded an admirable opportunity of studying the young horned lizards, which are produced alive and a few minutes after birth are able to scurry over the ground with an agility equal to that of the parent. The average brood of young among these specimens numbered ten. The young creatures appeared quite smooth. Their skin was soft and delicate. All of these young reptiles were born during the early part of September.

THE MEXICAN HORNED LIZARD

Phrynosoma orbiculare Wiegmann.

This species falls readily into the first group of the genus, by reason of its short horns and exposed ear drums. The scales

The Horned Lizards

of the abdomen are *smooth*, and the chin scales are small and regular with no enlarged rows. The enlarged scales of the back are but slightly bristling.

The horns are barely larger than those of Hernandez's Horned Lizard; the central horns are the larger and of about the same length as the horizontal diameter of the eye opening. As with Douglass's Horned Lizard and its varieties, there is a single row of spiny, marginal scales on the side of the body.

Colouration.—Dark reddish brown above, with four transverse brown or black spots on each side of a pale band from the back of the head to the tail; these spots are generally bordered with yellow. The tail is banded. The abdomen is yellow, spotted or marbled with black.

<i>Dimensions</i> .—Total Length	5½ inches.
Length of Tail, Male,	2½ "
Greatest Width of Body	1½ "
Length of Central Horns	½ "

The tail of the female is much shorter than that of the male.

Distribution.—Extreme southern Arizona—possibly New Mexico and southwestern Texas. Northern and central Mexico, generally.

THE REGAL HORNED LIZARD

Phrynosoma regale, (Girard)

In every character, this is the finest species of the genus. It attains a considerable size (for the genus) and the circlet of large, flat spines upon the rear of the head at once impart a unique aspect. There are *four* large central head spines and three spines upon each temple. All of these spines or horns are in such perfect alignment that a crown-like effect is produced.

Of all the species of Phrynosoma, this stands unique in the possession of *four* central head spines (occipital spines). The plates beneath and parallel with the lower lip plates (*labials*) are exceedingly projecting. *There are two rows of enlarged scales on each side of the chin*. The scales of the abdomen are smooth. There is a single row of spine-like scales along the side, and beneath this, for a portion of the body's length, a much smaller fringe.

The Horned Lizards

The large scales of the back have four keels, which combine in forming a sharp point.

Colouration.—Pale brown, with a narrow, pale band on the back. There are two obscure, dark blotches on the neck and three or four dark blotches on each side of the back. All the markings are obscure. Beneath, the colour is yellowish white, with or without spots.

Dimensions.—Total Length (Grows to 7 inches)... $5\frac{1}{2}$ inches.
Length of Tail..... $1\frac{3}{8}$ "
Greatest Width of Body..... $2\frac{1}{4}$ "
Length of Outer Pair of Central Horns $\frac{3}{8}$ "

Distribution.—Southern Arizona—the Gila and Colorado Deserts; Sonora, Mexico.

This species has usually been considered very rare and is seldom seen in collections, and the writer was much surprised to examine a dozen living specimens, received in one shipment, from Phoenix, Arizona, that had been collected by Mr. George F. Breninger. Following is a portion of a letter from Mr. Breninger:

"The horned toad I am now sending you is the true form of the desert." (This refers to a specimen of *Pbrynosoma calidiarum*). "It is quite a different 'toad' from those taken about the city" (*P. regale*) "which, I believe, have been brought from elsewhere, for ten years ago they were rare."

The writer has also received several specimens of the Regal Horned Lizard from Tucson, Arizona. These were especially large specimens, with quite distinct markings and pink horns.

Habits.—As a captive, this is one of the most hardy species of the horned lizards. When handled it tries to defend itself by thrusting its head upward and backward, thus bringing the spines vigorously into contact with one's fingers.

CERROS ISLAND HORNED LIZARD

Pbrynosoma cerroense, (Stejneger)

The present species seems to be closely allied to the Pacific Horned Lizard, from which it differs in having but a single row of the spiny, marginal scales, and having *rounded* horns. There are two central horns, and three successively enlarged horns on each temple. On each side of the chin are three rows of enlarged scales. The abdominal scales are smooth.

The Horned Lizards

Colouration.—Brownish gray. A dark patch on each side of the neck, and three irregular cross-bands on the back. Abdomen cream colour, with dusky spots.

Dimensions.—Total Length $4\frac{7}{8}$ inches.
Length of Head and Body $3\frac{1}{8}$ "

Distribution.—The type specimen was taken on Cerros Island, off the west coast of Lower California at about the middle of the peninsula. The species has not been found elsewhere.

THE PACIFIC HORNED LIZARD; CALIFORNIA HORNED LIZARD

Pbrynosoma coronatum, (Blainville)

The Pacific Horned Lizard is narrower of body than other species and the proportionately longer tail accentuates this character. The large and numerous spiny scales of the back and tail, impart by much the most bristling appearance of any of the North American species. There are two large, central head spines, and three successively larger spines on each temple. All of the horns are flat. There are from three to four rows of enlarged scales on each side of the central line of the chin. On each side of the body are *two* rows of fringe-like spiny scales, the upper series the larger. The scales of the breast and abdomen are smooth.

Some specimens have one, some two rows of spiny marginal scales on the tail. Upon this variation was based a species known technically as *Pbrynosoma blainvillei*, (Gray). As other distinctive characters are lacking and as specimens of this alleged species show the same peculiar body outlines of this very distinct Western lizard, we must place the name in the category of a *synonym*, under the head of the present species.

Colouration.—Pale grayish or brown above, with a large, reddish-brown patch on each side of the nape; three, transverse bands of similar colour on the back, often bordered in the rear with white or yellow spots. Abdomen yellow, with dusky gray patches. Many examples have horns of a decidedly pinkish tinge.

Dimensions.—The measurements given are of an adult specimen from San Diego County, California:

The Horned Lizards

Total Length.....	6½ inches.
Length of Tail.....	2½ "
Greatest Width of Body.....	1½ "
Length of Central Horns.....	¾ "

The tail is very broad at the base and tapers very gradually for the greater part of its length.

Distribution.—Southern portion of the Pacific region. The ranges of the species is from immediately south of San Francisco, southward into the peninsula of Lower California and into Sonora, Mexico. It is particularly abundant in the desert regions of San Diego County, California.

Habits.—A very hardy lizard in captivity. Of the various species of *Phrynosoma* observed by the writer, specimens of this reptile have lived the longest and adapted themselves most readily to captivity. They are very fond of mealworms, but will also take ants, grasshoppers and crickets.

THE TEXAS HORNED LIZARD

Phrynosoma cornutum, (Harlan)

Most widely distributed and abundant of all the horned lizards. It is the proverbial horned "toad" brought back by the Eastern traveller from his trip to Texas.

The head spines are large. There are two central horns, *rounded* and directed rather sharply upward. On each temple are three successively larger horns, the last or rear one slightly smaller than the central pair (*occipital horns*). Slightly beneath the lower lip plates (*labials*) is a row of enlarged and projecting plates. *On each side of the central region of the chin is a single row of enlarged scales.* Among the great majority of specimens, the scales of the abdomen are keeled; a few have faintly keeled or smooth scales. There are two well-developed series of marginal, spiny scales.

This is a very stout, rounded species, with a small, thin tail. Its outlines are in strong contrast to the preceding one.

Colouration.—The markings are very distinct. A vividly-defined, yellow band on the back, extends from immediately behind the head and down the tail. On each side of the nape is a large, dark blotch. Three dark rounded spots on each side of the back, usually bordered in the rear with a narrow crescent of bright yellow. On the top of the head are

The Horned Lizards

three dark bands; beneath the eye are three wider bands. Abdomen yellow with numerous dark, round spots.

Dimensions.—Following are the dimensions of a large specimen from Texas:

Total Length	6 inches.
Length of Tail	$1\frac{7}{8}$ "
Width of Body	$2\frac{3}{8}$ "
Length of Central Horns	$\frac{7}{16}$ "

Distribution.—In the Central States this species occurs as far eastward as Missouri, and has been recorded in western Illinois, though it does not, at the present time, appear to exist as far east as the locality of the latter record. Farther south, its most easterly limit is western Arkansas and thence on a line southward to Galveston, Texas. Westward the species ranges throughout the great state of Texas, through New Mexico, Arizona and into eastern California. Its most northerly limit in the United States, appears to be Nebraska. In Mexico it occurs in the states of Chihuahua and Sonora. It is most abundant in Texas.

Habits.—The habits are in no way different from the other horned lizards described. It is fairly hardy in captivity, but does not live so well as the California species, or the fine, Regal Horned Lizard of the Arizona deserts.

DITMARS' HORNED LIZARD

Pbrynosoma ditmarsii, (Stejneger)

In considering this recently discovered species, we arrive at what might be termed the second group of horned lizards. The general size of the species is rather smaller than those previously described, while the scalation of the body is finer. Thus these species appear much smoother and less bristling than the former lizards. With several of the species, the ear drum is covered with granular scales and is not visible externally. Like that portion of the genus already treated this latter portion is so arranged that the species with rudimentary horns precede those with well developed head spines.

The present species is practically hornless and has the widest head of any of the genus. The head is considerably wider than long. The region of the temple is produced into a flat, crest-like prominence, bordered in the rear with large scales, but no

actual horns. On the lower jaw are two rows of enlarged, very keen-edged plates, which, instead of being parallel with the lower lip plates as with other species, extend obliquely from them, downward. The central chin scales are small and of uniform size. The scales of the abdomen are strongly keeled.

The back of this species is quite smooth, and sprinkled with enlarged, keeled scales laying quite flat against the skin. There is no margin of spiny scales. Lacking the head spines and bristling, spiny exterior of most of the species, the aspect is very toad-like.

The tail of the female is much shorter than the male.

Colouration.—Sandy red, with obscure, dark cross-bands on central portion of the back.

Dimensions.—Total Length (Male Specimen) 4 inches,
 Width of Body 1½ "
 Width of Head 1½ "
 Length of Head 1 "

Distribution.—But two specimens are known—a male and a female. They were taken in Mexico, in the state of Sonora, a short distance south of the southern border of Arizona.

Habits.—The writer has observed but one living specimen. It was an interesting creature and lived about a year. It would feed only when the sun was shining brightly upon the sand of the cage, when it took large ants, grasshoppers, crickets and mealworms. The ants were snapped up in a manner appealing much to the habits of the true toads—namely, the bending of the head downward toward the prey, the instant protrusion of a pink tongue and the sudden disappearance of the insect in a movement so quick that the human eye was unable to follow it. This movement was attended by a single gulp on the part of the reptile. There was no subsequent mastication. The swallowing of larger prey was attended by a curious series of manœuvres. There was the same momentary, downward pointing of the head and the prey was conveyed to the jaws like a flash, but as it was too big to be drawn entirely into the jaws by the action of the tongue, it was roughly masticated and worked into the mouth by an extraordinary process of wiping the jaws from one side to another upon the sand and with such vigor and rapidity that numerous grains were thrown against the glass sides of the cage. After swallowing a large

The Horned Lizards

insect, the reptile assumed an astonished expression, opening the eyes widely, then nodding the head violently up and down, six or eight times.

Although the general demeanour of the horned lizards is timid and inoffensive, occasional specimens make ludicrous attempts at self defence. The present specimen was curious in this regard. When annoyed it would arch its back, point its snout downward, then make jumps of fully an inch from the ground, from this position, each jump being accompanied by a miniature hiss, which sounded like a sneeze. The performance was altogether clown-like and far from alarming. When the lizard discovered that its efforts were unsuccessful in driving the intruder away, it resorted to flight, in a scamper for a dark corner. Late in the afternoon it so buried itself in the sand, that only its nostrils and the crown-like top of the head were visible, and these so closely matched the colour of the sand that a close inspection was necessary to find it at such times.

The animal died from inflammation of the intestines, a condition that kills many of the captive horned lizards and may result from the change of environment, from the absolutely dry and warm sands of the desert—the home of most of the species—to the general clamminess that pervades sand or gravel in our damp, Eastern climate, unless the bottom of the cage is heated by steam or hot water pipes—rather a difficult provision in a private collection.

The rarity of this horned lizard might be accounted for in the consideration of its relatively smooth skin and absence of head spines, rendering it an easy prey for various snakes. Thus the general abundance of those species with bristling body spines and long horns upon the head might also be explained.

THE LITTLE HORNED LIZARD

Phrynosoma modestum, (Girard)

Appeals to Ditmars's Horned Lizard in the absence of the marginal, spiny scales, at the edge of the abdomen. It is a comparatively smooth species, and the head spines are small. Thus it lacks the spiny, bristling appearance of the larger species. Like the preceding, the ear drum is exposed or but partially covered with granular scales, *a character which removes it from all of the succeeding horned lizards.* The scales of the abdomen



TEXAS HORNED LIZARD, *Phrynosoma cornutum*

Commonest and most widely distributed of the horned lizards. Found from Missouri to Texas and westward to California



ASHY HORNED LIZARD, *Phrynosoma munitum*

A rare species. Found in the deserts of Arizona and eastern California



KEELED LIZARD, *Gerrhonotus multicarinatus*

An abundant lizard in the Pacific Region. Its shingle-like scales and the deep fold on each side—characteristic of the *Anguina*—readily distinguish it from lizards of other families in the United States



LONG-TAILED EXAMPLE OF THE KEELED LIZARD, *Gerrhonotus multicarinatus*

The total length of this specimen is 15½ inches, of which the tail takes up 10 inches

are smooth and there are no enlarged rows of scales in the central portion of the chin.

Colouration.—Pale, yellowish, or pinkish. A large black patch on each side of the nape—but this is sometimes indistinct. There are practically no cross-bars on the back, although the tail is usually banded. The abdomen is yellowish-white and, with the exception of the region of the vent, is immaculate; there are frequently several small patches of black both in front and behind the vent.

Dimensions.—Total Length $3\frac{3}{4}$ inches.
Length of Head, including Horns . . . $1\frac{1}{8}$ "
Width of head, including Temporal
Horns $1\frac{3}{8}$ "

Distribution.—Western Texas, New Mexico and Arizona; the states of Chihuahua and Sonora, Mexico.

THE ASHY HORNED LIZARD

Pbrynosoma calidiarum, (Cope)

The ear drums are not visible, being covered with fine, granular scales. Among those species that follow, all of which exhibit this character, *the present one may be recognised by the single row of marginal, spiny scales.*

Back quite spiny; head spines well developed, particularly the central horns, which are directed quite sharply upward. Upon gross examination this resembles the Texas Horned Lizard, *P. cornutum*. The central portion of the chin is covered with small scales, of *uniform size*. The scales of the abdomen are perfectly smooth.

Colouration.—Ashy-gray, with wavy black cross-bars. Abdomen immaculate white; on the chin and at the base of the tail are a few black spots.

Dimensions.—The measurements of an adult male, from the Gila Desert, are given:

Total Length $4\frac{1}{2}$ inches.
Length of Tail $1\frac{1}{2}$ "
Greatest Width of Body $1\frac{1}{2}$ "
Length of Central Horns $\frac{1}{4}$ "

Distribution.—Appears to be very rare. The type specimen was taken in Death Valley, eastern California. The writer received a specimen from the Gila Desert, south of Phoenix, Arizona.

The Horned Lizards

GOODE'S HORNED LIZARD

Phrynosoma goodei, (Stejneger)

Goode's Horned Lizard is one of the smallest species of the genus. It attains a slightly larger size than the *P. modestum*, the Little Horned Lizard. The spiny scales of the back are but slightly protruding and the general aspect is that of a toad-like creature with quite smooth, granular skin. *The ear drum is covered with granular scales.* Two rows of marginal, spiny scales, but the lower is very fine and small. Scales of the abdomen perfectly smooth.

The head spines are peculiar; they are of fair size, but the two rear temporal horns are quite the size of the central (*occipital*) horns.

Colouration.—Alcoholic specimens are grayish above and white beneath. There is a blackish spot on each side of the nape, and a series of black spots on each side of the back. The abdomen is white and immaculate.

Dimensions.—Total Length 4½ inches.
Length of Head and Body 2½ “

Distribution.—This is a desert species. It has been taken in Sonora, Mexico, and possibly occurs in southern Arizona.

THE SMOOTH HORNED LIZARD

Phrynosoma platyrbinum, (Girard)

This abundant species differs from the other horned lizards having the ear drum covered with granular scales and possessing a fairly smooth skin, *in the structure of the head spines, which are rudimentary.* They are barely longer than the horizontal diameter of the eye-opening. *There are two single rows of slightly enlarged scales on that portion of the chin embraced by the sharp, projecting plates beneath the lower labials.* Scales of the abdomen smooth; two series of marginal, spiny scales at the edge of the abdomen—the lower but slightly developed.

Colouration.—Pinkish-gray or brownish-gray; a large, dark patch on each side of the nape. The back is marked with dark, wavy cross-bands, which may be very indistinct. Abdomen immaculate white.

Dimension.—Total Length 5 inches.
Length of Head and Body 3¼ “

Distribution.—Abundant in the desert and sub-arid regions of eastern California, Arizona, Utah, Nevada and southern Idaho.

MACCALL'S HORNED LIZARD

Pbrynosoma maccallii, (Hallowell)

The last lizard of this genus is of rare occurrence. It has the longest head spines of any of those species with concealed ear-drums. There are two series of spiny, marginal scales on the body, the upper of which is the longer. In the central region of the chin are two single rows of slightly enlarged scales. The scales of the abdomen are smooth. The skin of the back appears very smooth as compared with other horned lizards.

The head spines are peculiar. There are two very large central spines; only the two rear spines of the temples are large—this in place of the three *successively* larger temporal spines of most species.

Colouration.—Ashy-gray; a narrow, brownish line upon the back; on each side this are two rows of round, brown spots each containing a paler centre, which in turn is centered with a brown dot.

Dimensions.—Total Length 3 $\frac{1}{2}$ inches.
Length of Head and Body 2 $\frac{1}{8}$ "
Width of Body 1 $\frac{5}{16}$ "

Distribution.—The Colorado Desert. The United States National Museum has specimens from Fort Yuma, Arizona. It appears to be a very rare species.

Habits.—Nothing is known of the habits.

The desert fauna of the United States is not only distinct, but highly interesting. One of the most fascinating exhibits in the reptile house of the New York Zoölogical Park, is the "desert room." Here, even the most casual observer will at once note something peculiar about the lizards and the snakes—their pallid hues, their remarkable similarity to the sand and their adaptability to the dry, loose soil, in their movements of burrowing or progressing at great speed over a surface where many reptiles would be clumsy. At a temperature in which some reptiles thrive, these creatures of the deserts are sluggish. They flourish and are most active in a heat that is practically unendurable to the human. This phase of reptile life is worth much space—much more than can be given to it in the present work.

CHAPTER XVIII: THE PLATED LIZARDS AND SNAKE-LIKE SPECIES

The Families ANGUIDÆ and ANIELLIDÆ, Embracing the North American Genera GERRHONOTUS—Plated Lizards; OPHISAURUS—Glass "Snake" and ANIELLA—Ground "Snake."

FAMILY Anguidæ; the Plated Lizards and Glass "Snakes:."

With this family, the student is referred to a group of degenerate lizards, all of which are elongate and serpentine in form, and either possess small and rather weak limbs, or are externally wholly devoid of these organs. The latter species are often mistaken for snakes, which is a natural consequence, owing to the methods of progression and the serpentine outlines, in every way appealing to the snake rather than to the lizard. There are forty-four species of this family; they inhabit both the New and the Old Worlds. They are most abundantly represented in Mexico and in Central America. The species are characteristic from *the presence of a deep fold on each side of the body.*

The Plated Lizards; Genus Gerrhonotus: The body is slender, with large, square scales above, arranged in regular, ring-like rows; with most of the species, the scales of the middle portion of the back are strongly keeled.

Along each side of the body, from behind the ear to the base of the hind limb, is a strip of soft flesh, containing small, granular scales; against the lower border of this strip, the edge of the abdominal sheet of scales fits loosely, forming a deep fold.

The head is distinct from the neck and pointed at the snout. The limbs are rather small and the tail very long and brittle—frequently twice as long as the head and body.

Four species of this genus inhabit the extreme western and southwestern portions of the United States. Nineteen species are recognised, the greater number occurring in tropical Mexico and Central America.

Like many other genera among the reptiles these lizards have encountered a share of the undue enthusiasm displayed



BROWN LIZARD, *Gerrhonotus liocephalus*
May be identified by the several rows of smooth scales on each side



KING'S LIZARD, *Gerrhonotus kingii*
The most brightly coloured member of its genus. The scales are faintly keeled



PLATED LIZARD, *Gerrhonotus imbricatus*

Distinguished from the three preceding species by two (2) pairs of plates anterior to the frontal plate—that between the eyes
A Western species



GLASS "SNAKE," *Ophisaurus ventralis*

A snake-like representative of the *Anguilla*, inhabiting the Southern States. Several very similar species are found in Europe and Asia

The Plated Lizards and Snake-like Species

in founding new species and sub-species upon variations that are of little importance. There has been a number of species described as occurring in the United States and the descriptions of them have been based upon slight differences of scalation and *distribution*. If these obscurely different specimens were mixed among varying individuals of the really staple species and the locality labels removed, it is doubtful if the observers of their "distinctly" different characters could pick them out again. Thus it appears that the different species described as occurring in the United States must simmer down to four, a key of which is herewith presented:

- I. Three shields arranged in triangular fashion, in front of the large shields between the eyes.

Scales of the back *and the sides* strongly keeled.

KEELED LIZARD, *G. multicaudatus*.

Habitat.—Widely distributed. The Pacific Coast region, from British Columbia to Central America.

Scales on the back strongly keeled; *those of the sides smooth*.

BROWN LIZARD, *G. liocephalus*.

Habitat.—Texas and Mexico.

Scales of the back feebly keeled; those of the sides smooth.

KING'S LIZARD, *G. kingii*.

Habitat.—Arizona, New Mexico, western Texas and northern Mexico.

- II. Three *pairs* of shields in front of the large shields between the eyes.

Scales of the back keeled; those of the sides smooth.

PLATED LIZARD, *G. imbricatus*.

Habitat.—Western Texas; Mexico.

Detailed descriptions of these species follow:

THE KEELED LIZARD

Gerrhonotus multicaudatus, (Blainv.)

Slender in form, with very long and gradually tapering tail. The scales of the upper surfaces are very strongly keeled, particularly on the back and top of the tail. The scales of the abdomen are oblong in shape and highly polished; they are arranged in the same ring-like formation as those above.

Colouration.—Above, the colour is brown or olive, with numerous dark and wavy cross-bands, many of which are bordered with white spots. The soft strips of skin on the sides

The Plated Lizards and Snake-like Species

are much like the general ground colour and usually contain rounded patches of white. The abdomen is greenish-white.

Dimensions.—Following are the measurements of a specimen of average size, from California:

Total Length.	11 $\frac{3}{4}$ inches.
Length of Tail.	7 $\frac{1}{2}$ “
Greatest Diameter	$\frac{3}{4}$ “
Width of Head.	$\frac{1}{8}$ “
Length of Head	1 in. (to behind ear.)
Length of Hind Limb.	1 $\frac{3}{8}$ inches.
Length of Front Limb	1 $\frac{1}{16}$ “

The largest specimen examined furnished the dimensions given below:

Total Length.	15 $\frac{1}{4}$ inches.
Greatest Diameter	1 “
Width of Head.	$\frac{3}{4}$ “

Distribution.—This is the only species of the genus that is widely distributed north of Mexico. It occurs throughout the Pacific Coast region from British Columbia southward to Lower California—inclusive. It ranges eastward into Texas, thence into Mexico and Central America.

Synonyms.—The following technical names have been applied to this species: *G. cæruleus*, *G. burnetti*, *G. wiegmanni*, *G. scincicauda*, *G. principis*, *G. grandis*, and others that have appealed to alleged sub-species or varieties.

Habits.—As the species of this genus appeal closely to one another in habits, these may be generally summed up under the head of the present reptile. The different species inhabit a variety of country, being found in forests, rocky situations and belts of chapparal. They are frequently found at an elevation of from 7,000 to 9,000 feet.

These lizards are less agile in their movements than other lacertilians of their size—such as the swifts and skinks—though they are by no means sluggish. However, they are more easily captured than the majority of their kind. While progressing leisurely over rough places, they are often quite snake-like in actions, the slender body and long tail following the outlines of the declivities, and, although the small limbs are constantly in use, the effect resembles a gliding movement. Such actions

The Plated Lizards and Snake-like Species

demonstrate the close relationship of these lizards to the serpent-like—limbless species.

All of the species of *Gerrhonotus* are provided with a well-developed and thick tongue, forked at the tip. When progressing—if not frightened, and hurriedly seeking shelter—the tongue is frequently protruded, generally to touch lightly the surface over which the creature crawls. After eating, the lizard employs the tongue vigorously to wipe the lips, and even though the prey be a small beetle, that has been swallowed practically entire, the same elaborate proceedings follows. The food consists mostly of insects, such as grubs, and the slower-crawling kinds. Captive specimens are very fond of mealworms. Occasional specimens are cannibalistic, devouring small lizards of other species, that may be placed in their cage.

The Plated Lizards evince the habit of parting with their tails upon the slightest provocation. Captive specimens with perfect tails are rather in the minority. Although many lizards will suddenly part with the tail by twisting themselves from one's grasp and leave the greater part of the caudal appendage withering violently, to engross the enemy's attention, while the creature scampers off, the species of the present genus appear to be able to discard the tail voluntarily by a sudden throw of the appendage, as they are pursued and running for shelter. The abandoned tail twists, wriggles and undergoes such lively movements that if cast off in dried leaves or grass would cause enough commotion to cause the pursuer to stop and investigate it. Thus the tail may be said to play the part of a decoy in retarding the progress of the enemy. At the part where it has broken from the base, the cast-off portion looks remarkable, as it displays protruding, swollen filaments of flesh, these spreading from the member like the petals of a flower. If the lizard be examined, the stump of the tail will be found to contain cavities to represent these protuberances.

One might be led to imagine that the broken portions of the tail could be fitted together, but close investigation will show that the petal-like filaments are swollen in proportion to their original bases as is a champagne cork to the mouth of the bottle. The operation of shedding the tail is a bloodless one. Some weeks after the tail has been lost, a new member starts to grow slowly, appearing in abrupt, pointed fashion from the

The Plated Lizards and Snake-like Species

thick base of the original member. (Illustrated.) The new tail rarely attains more than half the length of the first appendage.

When first captured these lizards will bite viciously, inflicting a decided pinch. They are hardy as captives and ultimately become very tame, learning to take flies and mealworms from the fingers without any signs of fear. To successfully maintain them, they should be kept in a warm and dry place, and provided with sand and rocks. They thrive best if their cage is exposed to a few hours sunlight daily—a rule however, which does not apply to the intense heat of the sun in mid-summer.

The species of *Gerrhonotus* give birth to very active young; the young are born in a membranous sac, like the viviparous snakes. They are much paler than the parent and look smooth and glossy. At this stage they are strikingly like the Eastern Ground Lizard, *Lygosoma laterale*.

THE BROWN LIZARD

Gerrhonotus liocephalus, (Wieg.)

Size and outlines similar to preceding species, but the scalation is different. Eight to ten rows of scales on the back are strongly keeled. *The scales of the sides are smooth.*

Colouration.—Above, the colour is greenish-brown, with wavy, dark cross-bands, bordered with white spots. In the soft patch of skin above the fold, are usually black spots or rings. With the majority of specimens there is a yellowish streak extending from below the eye to the angle of the mouth.

Distribution.—In the United States, this species occurs only in western Texas. In Mexico, it is widely distributed.

Like the other allied species, it exhibits considerable variation of colour and scalation, but the differences noted in a large series of specimens are not sufficient to warrant varietal names.

KING'S LIZARD

Gerrhonotus kingii, (Gray)

General outlines and size similar to the preceding, but the scalation is quite different. The scales of the back—from six to eight rows—are very bluntly keeled; with some specimens these scales appear smooth, unless closely inspected. The scales of the sides are smooth.

The Plated Lizards and Snake-like Species

Colouration.—The pattern is strongly defined—the ground colour being ashy gray or pale olive, crossed by bars of pale brown that are narrowly bordered with black. The tail is brightly ringed above.

Distribution.—Southern Arizona, New Mexico, western Texas and northern Mexico.

THE PLATED LIZARD

Gerrhonotus imbricatus, (Wieg.)

Differs from the two preceding species, in its more obsolete pattern, proportionately shorter tail and broader head. In front of the large shields between the eye *are three pairs of smaller shields*, in place of the three shields arranged in triangular fashion that will be noted with the majority of the species. The scales of the back are strongly keeled to the number of eight or ten rows; those of the sides are smooth.

Colouration.—The pattern is very indistinct, and the majority of old specimens are uniform brown.

Dimensions.—Total Length 10½ inches.
Length of Tail. 4½ “
Greatest Diameter. 1½ “
Width of Head. 1 “
Length of Head (to back of ear) . . . 1½ “

Distribution.—The extreme southwest portion of Texas, and possibly southern Arizona and New Mexico; northern and central Mexico generally. Occurs to an elevation of 11,000 feet.

The Genus Ophisaurus.—But one species of this genus is known. It is the familiar Glass “Snake,” quite snake-like in aspect; having no traces of external limbs. In North America, it is the only limbless representative of the Family *Anguidæ*. The limbless species of this family occur principally in southern Europe, Asia and Africa. The Sheltopusic (*Pseudopus apus*), and the Blind “Worm” (*Anguis fragilis*), are familiar Old World examples.

A description of the New World species follows:

THE GLASS “SNAKE”

Ophisaurus ventralis, (Linn.)

The body is slender, elongated and very serpentine, with no traces of limbs. *From a snake, however, this creature may at*

The Plated Lizards and Snake-like Species

once be told by the presence of well-developed eye-lids and ear-openings, while the abdomen is provided, in place of the broad, crawling scutes of a snake, with numerous rows of smooth and overlapping scales, which are of no use in locomotion. The scales of the back are arranged in ring-like rows.

Along each side of the body is a deep fold, this dividing the dark ground colour of the upper surface with the pale hue of the abdomen. The fold extends from behind the head to the base of the tail and defines the proper beginning of the latter appendage, which forms about two-thirds the entire length of the reptile.

The upper surface is smooth and glassy. Although the general formation of the body appeals to a snake, this reptile is more rigid in body than a serpent and thus incapable of assuming the many graceful, lateral undulations of the ophidian. It progresses by means of a few, rather stiff, undulatory movements from side to side.

Colouration.—Ground colour above, olive, brown or black, with several dots of bright green, within each scale; on the neck these spots form lines. The head is speckled with the same bright colour. Beneath, the colour is uniform, greenish-white.

On some specimens the spots on the sides fuse in a fashion that produces the effect of narrow and serrated greenish stripes. On occasional specimens the spots of both the sides and the back thus fuse, imparting a narrowly striped pattern over the entire upper surface.

Dimensions.—The measurements of an average-sized adult are given:

Total Length	27	inches.
Length of Tail	17½	"
Greatest Diameter	2	"
Width of Head	1½	"
Length of Head	1½	"

The largest specimen examined measured 37 1-2 inches in length, which was considerably in excess of the normal. This specimen is in the Museum of Comparative Zoölogy at Cambridge, Mass.

Distribution.—The Glass "Snake" is widely distributed and occurs well into the North, although not along the Atlantic coast, in the most northern part of its range. In the extreme

The Plated Lizards and Snake-like Species

East it is common from North Carolina to Florida. In the central portion of the United States, however, it occurs in Nebraska (its western limit of distribution), Wisconsin and Illinois. It extends southward through Texas and into northern Mexico.

Habits.—That the Glass "Snake" is able, after being shattered into many fragments, to collect itself together again and continue to exist as before the injury, is an old, but wholly erroneous idea. The species is odd only from the fact that a true lizard can be so destitute of crawling appendages. Its habits are quite ordinary, despite the eccentric form.

Like the character observed among many lizards to a more or less marked degree, the Glass "Snake" may readily divest itself of its tail in case of emergency. As it happens with this particular species, the body parts with the tail with more facility than is noted among most lizards. The reptile cannot be appropriately described as "brittle" for the loss of the tail is largely voluntarily and in many instances permits the lizard to make its escape from an enemy, and ultimately grow a new, though abbreviated caudal appendage.

When pursued, this creature glides away at anything but a rapid gait as compared to the dash of most lizards. It stands but little chance of escape by ordinary flight. Let us suppose the creature to be pursued by a very common enemy—the king snake. As the pursuer overtakes his prey, he grasps it at once. There is a sudden, twisting movement on the part of the Glass "Snake," and the victor finds that the smooth, scaly length he holds in his jaws is so vigorous that it requires much attention, for it twists and wriggles with great energy. Swallowing all his prey head first, the cannibal works his jaws along the victim to engulf it from such a position, when, after much manœuvring with the writhing quarry, the snake stops in some embarrassment. There is no head. The object that has engaged so much attention is simply the long tail of the lizard and the abbreviated owner has glided to safety.

Rather retiring in habits, the Glass "Snake" spends much of its time in burrowing. Its food consists of earthworms, slugs, and the larvæ of insects. When prowling it sometimes ransacks the nest of some small bird that builds upon the ground, and breaking the egg-shells with its strong jaws, laps up the contents with the flat, bluntly forked tongue.

The Plated Lizards and Snake-like Species

The Family *Aniellidæ*: The family is composed of a single genus and but one species, which is probably a much degenerated form of the *Anguidæ*.

BLIND "WORM"—WORM "SNAKE"—WORM LIZARD

Aniella pulchra, (Gray)

Small and worm-like. Ears concealed; eyes covered with translucent skin, and useless. Scales smooth and shining, arranged the same beneath as above; head pointed.

The species looks somewhat like the European Blind "Worm" (*Anguis fragilis*).

Colouration.—Brown, or silvery gray; a dark band on the back and a band on each side of the body. Scales often edged with brown.

Variations.—A dark, purplish variety is sometimes found. It is yellowish beneath.

Dimensions.—Total length, $7\frac{1}{2}$ inches; length of tail, $2\frac{3}{4}$ inches.

Distribution.—Southern California, from San Francisco southward. The majority of specimens are from San Diego County.

Habits.—A burrowing form.

CHAPTER XIX: THE BEADED LIZARDS

FAMILY HELODERMATIDÆ

*A Family Composed of but Two Species—The Gila Monster and the Mexican Beaded Lizard—Both of the Genus HELODERMA
Descriptions of the Species—Their Habits*

HEAVY-BODIED, vividly marked, and with skin possessing closely set, bead-like tubercles, the two species comprising the family *Helodermatidæ* are quite unique in form and thus easily distinguishable from the other North American lacertilians. They are, moreover, *poisonous*, being provided with grooved fangs, which appeal much in their make-up to the poison conducting teeth of those serpents belonging to the division *Opisthoglypha*.

These creatures are the only known poisonous lizards inhabiting the New World. One is confined to southern Arizona and New Mexico; the other is found in western Mexico and northern Central America. The latter species really occurs far south of the limits embraced by this work, but it is included in order to present a perfect outline of this family.

Considerable has appeared in print concerning the poisonous nature of the Beaded Lizards. Different opinions vary to a great degree. Some writers allege that they are but mildly poisonous, with a venom but slightly dangerous to mankind, and these authors are usually men of technical knowledge, but unfortunately given to theory after the examination of alcoholic specimens. Other, and more popular writers, who have actually observed the lizards in the wild state and noted their actions upon capture, declare them very poisonous. And yet there are others, and among them scientific men, who have scoffed at the idea of these reptiles being in any way venomous. Similar assertions have been frequent in relation to certain snakes that are actually dangerous—simply because persons bitten by these snakes have suffered no ill effects beyond a few superficial lacerations produced by the teeth—a condition

The Beaded Lizards

followed by an emphatic declaration that the particular creature was wholly innocuous. As is usual, such hasty conclusions are of but little or no value and the incident in question may be easily explained. The person bitten was luckily seized only by the solid teeth, with which all snakes are provided, and not by the fangs, as the poison-conducting teeth, with that kind of snake, are situated in the rear of the upper jaw.

But to return to the Beaded Lizards. These reptiles do not *always* eject their venom when biting. The fangs are on the *lower* jaw bones, and as they are simply grooved, do not constitute the perfect instruments for the *forcible injection* of poison as those possessed by the Crotaline* and Elapine† snakes. Thus it may be understood how accidents have happened, serious consequences avoided and consequent and energetic denials of the venomous nature of these lizards have followed. After years of observation the writer unhesitatingly states that he considers the Beaded Lizards to be dangerously poisonous to man, and should be quite as much respected with that regard as the majority of venomous serpents. As very appropriately in line, he quotes an excellent authority on the poisons of reptiles—Dr. Gustav Langmann:‡

“The first confirmation of its” (the Gila Monster’s) “poisonous nature seemed to be established by the discovery of grooved teeth, about 3-4 mm. long, four on either branch of both maxilla and mandibular. . . . The mandibular appears somewhat swollen, owing to the projection of its disproportionately large, elongated submaxillary glands, whose four separate ducts lead to the base of the above-described grooved teeth. The buccal secretion is whitish, transparent, slightly turbid, somewhat viscid, alkaline. . . . It has the fragrant odour of calamus” (sweet-flag). . . . “When biting on a rubber cord an animal yields on the average five to six drops; a large animal once gave twenty-two drops. The saliva dries in grayish-white scales to one-eighth or one-tenth of its original weight.

“The arrangement of the teeth and of the glands makes us understand why opinions as to the poisonous nature of heloderma have differed so widely. When an animal seizes its victim only with the front teeth, or does not lie on its back while biting, none, or very little of the buccal secretion may enter the wound. When,

* The thick-bodied poisonous serpents—the rattlesnakes, copper-head, moccasin and fer-de-lance.

† Represented in the New World by the Coral Snakes.

‡ Reference Handbook of Medical Sciences.

however, a vigorous bite has been inflicted, the consequent phenomena have proven the venomous character beyond any doubt, and the hypodermic application of the pure saliva in sufficient doses has invariably proved fatal to the animals experimented upon—rabbits, mice and frogs.

"The first effect of the injection—an inability to sit or stand—is manifested after a short time, about ten to fifteen minutes in frogs, thirty minutes in rabbits. A certain drowsiness, similar to a narcosis, overpowers the animal; paralysis and insensibility seem to proceed from behind forward. The respiration is not laboured, but becomes gradually slower and superficial until the animal expires after a few hours with some hardly noticeable twitchings. The heart has first a period of increased activity, which is followed by gradual paralysis and a great fall of arterial pressure, due to vascular dilatation. While these symptoms appear after a small dose of venom, large doses seem to act directly upon the heart muscle, the animals dying within ten to twenty minutes with dyspnoea and convulsions. . . . The local symptoms, with rare exceptions, are entirely wanting; it is even difficult to find the spot where the venom has been injected. Yet it ought not to be forgotten that a few cases of persons bitten by a heloderma are on record in which extensive and painful local swelling is noted.

"The autopsy shows nothing but a very much dilated heart and an enormous venous congestion of all internal organs. The microscopical examination of the spinal cord, however, reveals extensive changes in the ganglion cells of the anterior horns; in fact, Baily found the changes almost identical with those described as due to the action of snake venom. It is not hard to believe, therefore, that snake venom and the saliva of heloderma are almost identical in chemical composition. . . .

"*Treatment.*—It is to be expected that the persons bitten by a heloderma will seldom exhibit grave symptoms, except when accidentally a blood vessel has been struck directly. A treatment after general surgical principles will suffice to subdue the local phenomena, while the organism has time to overcome the effects of the injected toxin. Yet a ligature ought not to be omitted, and otherwise the use of anti-venomous serum should be resorted to as well. The similarity of the toxins of snake venom and the saliva of heloderma justifies the administration of the same antidote."

The two species of Beaded Lizards may be generally distinguished, as follows:

Pink, or reddish yellow, and black.

Head mottled with the lighter hue.

GILA MONSTER, *H. suspectum*.

The Beaded Lizards

Pale yellow and black

Head entirely black.

MEXICAN BEADED LIZARD, *H. borridum*.

Detailed descriptions are given herewith:

THE GILA MONSTER*

Heloderma suspectum, (Cope)

Form and surface unlike other lizards; in place of scales, the body is covered with bead-like tubercles or points. Body stout, with short, stubby limbs. Tail short and thick—rounded.

Colouration.—Very variable as to pattern. The head and body are marbled with black and a pale hue, which may be salmon pink, flesh-colour, pinkish, white, or pale yellow. With some specimens the pale hue predominates—with others, the black. The top of the head generally shows considerable of the pinkish or yellowish markings.

Beneath, the colouration is much the same as above.

Dimensions.—The largest specimen of the Gila Monster that the writer has had the opportunity to examine, showed a total length of twenty-four inches, which is considerably over the average—this being given in the table of measurements:

Total Length	19	inches.
Width of Body	3½	"
Length of Tail	6	"
Diameter of Tail	1½	"
Width of Head	2½	"
Length of Head	2½	"

Distribution.—Desert regions of southern Arizona and New Mexico—the valleys of the Gila River and its tributaries. A few specimens have been taken in extreme northern Mexico.

Habits of the Gila Monster

In a wild state this creature is vicious and not nearly so sluggish in actions as is generally believed. It will turn and snap with the agility of an angry dog. In captivity, where it thrives and soon becomes accustomed to its surroundings, this lizard becomes the most docile of creatures and will permit itself

* Pronounced "Heela Monster."



The only poisonous lizard inhabiting the United States.

GILA MONSTER, *Heloderma suspectum*.
It has numerous grooved fangs on the lower jaw.

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Found in the deserts of Arizona and New Mexico.

to be handled in the most unceremonious manner without displaying a trace of bad temper.

A wild Gila Monster is a really formidable creature, if human arm or limb be within reach of its powerful jaws. The reptile's sudden twists as it snaps from side to side are wonderfully agile and difficult to avoid. During such demonstrations it gives voice to sharp hisses and opens its jaws widely, disclosing the black mouth-parts. Unfortunate indeed is the unwary one seized in those fang-studded jaws, for the lizard retains its hold with a tenacity rivalling a bulldog. The jaws must be actually pried or torn apart in order to free the object grasped, but to do this is beyond the power of the unaided fingers. If the head of the reptile be severed from the body, the vise-like grip remains the same. It is when the jaws are thus engaged and the fangs, of the lower are imbedded that the poisonous saliva flows from the swollen glands of the chin, fills the grooves of the venom-conducting teeth and is absorbed into the wounds caused by them. The writer remembers an experience with four freshly captured specimens that were snapping and hissing, when a stout strap was placed within reach of one of them. The strap was seized quickly, when another portion of its length was placed in front of a second specimen, which also took hold. This was continued until all four lizards had grasped the strap when it was suspended from a hook in the wall, the pugnacious creatures hanging by their jaws for ten minutes or more, when they dropped off, one after another. Subsequently, one of these same lizards seized a large rat snake (*Coluber obsoletus lindheimeri*), by the middle of the body. The snake writhed and coiled about its adversary in its efforts to escape, but these struggles appeared to infuriate the lizard, which retained its hold until the serpent was all but dead. The snake died a few hours after, either from the effects of the lizard's poison, or from internal injuries produced by the powerful jaws of its adversary—possibly a combination of both.

The four specimens described became very tame after a few weeks in captivity—a condition observed with most specimens. If approached suddenly and thus startled, they would quickly raise their heads and turn to ascertain the condition of affairs. They seemingly enjoyed the process of having their backs scratched and would lie motionless while this attention

The Beaded Lizards

was bestowed. At the time of writing the specimens have been over four years in captivity and share a cage with a number of colubrine snakes, over which they walk or are crawled upon by the serpents amid a display of good nature on either side.

As is the case with the majority of reptiles, the effects of outdoor air and unadulterated sunshine exercise a peculiar influence over the Gila Monster. Tame and docile specimens may be taken from an indoor cage and placed on a sandbank, well heated by a summer sun, when a quick mental change is noted. Within a few minutes they are actively nosing about, or digging burrows and when disturbed flash into a state of viciousness equalling that of perfectly wild specimens. This demeanour soon vanishes when the reptile is again placed indoors, although the temperature of the cage may fully equal that of the sandbank.

In its progression, the Gila Monster is rather slow and methodical. The body is not raised from the ground, but rather dragged along by the stout limbs. The actions are, however, by no means clumsy, and when annoyed but not inclined to fight, it moves with some show of agility, though no actual speed. During its progress the forked tongue is frequently employed to examine the ground over which the creature crawls.

Like other lizards, the skin of this species is shed in patches, although these are often large. Sometimes the skin of the entire under surface, and a great part of that of the back, strips off in one section, while that covering the limbs, head and tail is shed a day or so later.

The food of this species while in a wild state, is not definitely known. Many speculations have been advanced as to its character. Some allege that the natural food consists of ants; others assert that these reptiles feed only upon the eggs of birds and reptiles. Certain it is that in captivity the Gila Monster shows a decided liking for the eggs of fowls and reptiles and likewise decided indifference for insects and their larvæ. It is an interesting spectacle to see a number of captive specimens grouped about a pan containing beaten eggs, greedily lapping the contents with their long, flat tongues, then raising their heads to permit the fluid to run down their throats. Chopped meat may be mixed with the eggs, forming a wholesome combination on which the reptiles thrive. They will consume the crumbled pieces of hard-boiled eggs. If given an egg entire, they break

a hole through one end of the shell and lap out the contents. The small, soft-shelled eggs of lizards and the smaller snakes are masticated and taken as a whole.

Relative to the feeding habits, the structure of the tail of this lizard must be explained. It acts as a reservoir for the storage of nourishment, when food cannot be obtained. Among various specimens of both species of the Beaded Lizards, there is usually to be noted a marked difference as to the thickness of the tail. This either appeals to well-fed specimens, or to those that have been fasting *and absorbed the fat from the tail*. After a lizard of this genus has been feeding steadily, the tail becomes very thick and round. A specimen with the caudal appendage in this condition can fast for some months without discomfort, but during that time the tail steadily decreases in circumference. Thus it appears evident that Nature has provided the Beaded Lizards with a reservoir for surplus nourishment, and that they experience difficulty at certain times of the year in procuring food.

The Gila Monster is oviparous, depositing rather large, soft-shelled eggs, which are buried in the sand of its native home. A captive specimen deposited five eggs. One is figured. Illustration of a female and egg.

Concerning the breeding habits of the Arizona species, Walter Ralston, a sympathetic observer of reptiles, has given the writer valuable information.

Mr. Ralston has collected many Gila Monsters in Arizona and explains that the eggs are laid in July and August. The female scoops out a hole in *damp* sand, and deposits her eggs therein, when the sand is shovelled back again, entirely covering the eggs. A number of nests were discovered, and in these the eggs varied from six to thirteen. The majority of the eggs were buried to a depth of from three to five inches. The situation generally selected was open and exposed to the sun for the greater part of the day, though the nest was usually dug near a stream, where the infiltration kept the sand continually moistened. The adaptation of such conditions for the development of a reptile egg may be readily appreciated—moisture combined with the heat of the sun.

Several specimens captured by Mr. Ralston deposited eggs and he thus had admirable opportunities of studying the period

The Beaded Lizards

of incubation. Of the batch obtained half of them were placed in damp sand and exposed to the sun. The other half was buried in dry sand and likewise placed in the sunlight. The eggs that were kept damp hatched within a period of from twenty-eight to thirty days. Those placed in the dry sand shrivelled into small, hard and shapeless masses.

Upon first hatching the youngsters were of stout appearance and about four inches long. Their colours were more vivid than those of the adults.

Mr. Ralston further informs me that he examined some of the freshly laid eggs and found them to contain minute but well-formed embryos.

THE MEXICAN BEADED LIZARD—"ESCORPION"

Heloderma borridum, (Wiegmann)

In form, this heavy-bodied lizard is very similar to the preceding species, though *the tail is considerably longer* in proportion to the creature's length.

Colouration.—The general pattern and colours are quite different from the Gila Monster. The upper and lower surfaces are black or dark brown, with scattered spots and blotches of *rich yellow*. With the majority of specimens, the black predominates, and with many specimens the yellow is confined to single, scattered tubercles. *The head is usually uniform black.**

With young individuals the tail is broadly and vividly ringed with yellow, a character that appears to give way with maturity to narrow and broken rings. Young specimens are jet black, with vivid yellow markings. The older specimens show a brownish body colour, while the yellow is rather dull and not sharply defined on many. Although the writer has examined over fifty specimens of this species before compiling this description he has not noted a suggestion of the peculiar pinkish shades so often seen with the Gila Monster.

Dimensions.—The Mexican Beaded Lizard attains a larger size than the species inhabiting the United States. Following are the measurements of an adult specimen, from Guerrero, Mexico:

* An important character of differentiation from the Gila Monster with which the head is generally well blotched with the lighter hue.

The Beaded Lizards

Total Length	26½ inches.
†Length of Tail	12½ "
Width of Head	2½ "

From these dimensions, the proportionately much longer tail of this species than with the preceding one may be appreciated.

Distribution.—Between the *habitat* of this species and that of the Gila Monster, is a wide, dividing area. This reptile inhabits central and western Mexico, from latitude 25, southward to northern Central America.

Habits.—In its mode of life and disposition, the Mexican Beaded Lizard appears in no way to differ from the Gila Monster.

† Note the proportionately long tail.

CHAPTER XX: THE FAMILY *XANTUSIIDÆ*

A Small Family of Diminutive Lizards—Five Species Inhabit South-western North America

Classification and Distribution.—The Family *Xantusiidæ* is a small one, comprising three genera and a total number of seven species. *Lepidophyma* contains a single, Central American species; *Cricosaura* is also composed of one species, which inhabits Cuba; *Xantusia* contains five species—all inhabiting California and Lower California. The family is most nearly allied to the Old World *Lacertidæ*.

The North American species are diminutive, with rather cylindrical body and very short limbs. On the back and sides the scales are fine and granular; the abdomen is covered with plates; on the tail the scalation is in fine rings.

The top of the head is covered with large, symmetrical shields. There are three folds of skin on the throat. The species have no eye-lids and with most of them the eye is very large; all have a vertical (cat-like) pupil. The habit of frequently changing colour has been noted among these lizards; this is mainly influenced by light and temperature.

The species of *Xantusia* inhabit barren or desert regions. They are nocturnal in habits.

Key to the Species

I. Limbs very short.

a. Length about 3½ inches.

Eyes large. Pale brown, speckled with dark brown.

XANTUS'S LIZARD, *X. vigilis*.

Distribution.—Southeastern California.

Eye small. Dark clay color, with black specks.

A yellowish band on each side of back.

GILBERT'S LIZARD, *X. gilberti*.

Distribution.—One specimen known; from Lower California.

b. Length about 5 inches.

The Family *Xantusiidae*

Eye large. Blackish brown, irregularly marbled with cream-coloured lines.

HENSHAW'S LIZARD, *X. henshawi*.

Distribution.—San Diego County, California.

II. *Limbs proportionately longer.*

Eye large. Pale brown; two rows of large, pale-edged brown spots.

COPE'S LIZARD, *X. picta*.

Distribution.—One specimen known; from southern California.

c. *Length about 7 inches.*

Eye large. Gray or brown, dotted with black.

RIVERS' LIZARD, *X. riversiana*.

Distribution.—Santa Barbara Island, coast of California.

Mr. John J. Van Denburgh has added valuable information to the previous scanty descriptions of these lizards and their habits. In the following detailed list, the writer has drawn freely from Mr. Van Denburgh's paper on the genus.*

Xantus's Lizard, *Xantusia vigilis*, Baird. This is the smallest species. Together with the three succeeding species, it shows a single row of small plates directly over the eye. The remaining species, *X. riversiana*, has two rows of these scales.

The plates of the abdomen are in twelve (longitudinal) series.

Colouration.—"The ground colour on different specimens varies from smoke gray, through many shades of yellow and brown, to clove brown. Scattered granules are brown or black. At times these dark granules are so numerous as to become confluent with a tendency to form longitudinal lines. In other individuals they are scarcely visible. . . . A yellowish line usually runs back on the neck from the outer edges of each occipital plate. Two similar lines are sometimes present on the nape. The lower parts are creamy white, sometimes clouded with brown toward the sides. The young average much darker than the adults." (Van Denburgh.)

Dimensions.—Total Length 3½ inches.
Length of Tail 1½ "
Length of Hind Limb 1 "
" " Front " 7/8 "

Distribution.—Concerning the distribution, Mr. Van Denburgh has explained fully, thus: "The first representatives of

* *Proc. Cal. Acad. Sci.*, Ser. 2, Vol. X.

The Family *Xantusiidae*

Xantusia vigilis were found at Fort Tejon, California, by Mr. John Xantus, who furnished the three specimens upon which Prof. Baird based his original description, published in the Proceedings of the Academy of Natural Sciences of Philadelphia, 1858. Nothing more concerning it appeared until May, 1893, when Dr. Stejneger recorded two specimens, secured by the Death Valley Expedition in 1891. Nothing has been known about its habits and this very interesting species has been considered one of the rarest of our reptiles.

"*Distribution*.—In reality, *X. vigilis* is the most abundant lizard in the territory it has chosen for its home. It seems to be peculiarly dependent upon the presence of tree yuccas. A glance at Dr. Merriam's map* shows that these weird plants grow in each of the localities from which the species has been recorded, viz.: Fort Tejon in the Cañada de las Uvas, and Hesperia, in California, and Pahrump Valley, in Nevada.

"Dr. Charles H. Gilbert and the writer collected specimens near Mojave, and found a portion of a cast skin at Victor, California, in November, 1893. In September of the following year, the writer found this species common at Mojave and Hesperia, and secured a single specimen near Cabazon on the eastern slope of San Geronio Pass, California. The first three of these localities are situated in the great *Yucca arborescens* belt, which extends along the southwestern edge of the Mojave Desert. The last is in a small and apparently isolated grove of smaller tree yuccas, seemingly of another species.

"*Habits*.—Mojave, California, Nov. 4, 1893. About a mile from the station, there is a considerable forest of *Yucca arborescens*. The many trees and wind-broken branches, which lie decaying on the ground, afford a home to numerous colonies of white ants, scorpions, vicious-looking black spiders and several species of beetles. In a deep crack of one of these branches a small lizard was discovered which, when caught, proved to be a young *Xantusia vigilis*. Probably it had not yet learned how to hide from the day, for I have never seen another undisturbed individual.

"The key to their home once discovered, the collection of a large series of these lizards was merely a matter of physical exertion. Every fourth or fifth stem that was examined gave up its *Xantusia*, and in one instance five, as many as were previously known to collections, were found under a single tree.

The Family *Xantusiidae*

"Most of the lizards were found between the bark and the ground, but many had hidden in the thick clusters of dead leaves, from which it was very difficult to dislodge them. When first exposed to the light, they were dark coloured, and seemed dazzled for a moment, during which they made no attempt to escape. They were not at all sluggish, however, and, if not caught immediately, made for the nearest cover as fast as their very short legs would permit. This cover was often the collector, and the little lizards either hid under his shoes, or climbed his legs, sometimes even reaching his shoulders. They showed no desire to enter the numerous holes in the ground about them, or to escape by burrowing. Put into a glass bottle they became very light coloured in a few minutes, but began to turn dark again immediately after sundown. Young specimens were numerous, and remained dark longer than adults. Many fragments of cast skins were found, but never a whole skin in one place. The stomachs of several individuals contained the wings of some small dipterous insect, the elytra of a little brown beetle, and some very small white bodies which resemble spiders' eggs.

"Several specimens were taken alive to the Leland Stanford Junior University, and kept for some months in a large glass jar in which some fine sand and pieces of wood and bark had been placed. At first, they ventured out from their retreat only at dusk unless disturbed, but after a few days they seemed to become more restless, and, urged perhaps by hunger, showed themselves many times each day. At night, when they were always more active, they often climbed to the top of a piece of yucca stem placed upright in the middle of their cage. No desire to burrow was observed. All declined to show any interest in the small beetles and flies, both dead and living, which were placed in the jar, and finally became greatly emaciated. They were chloroformed in March, 1894.

"Mojave, Cal., Sept. 17-18, 1894. As it was not practicable to learn by actual investigation whether or not *X. vigilis* hid, during the day, among the thick-growing leaves of the living yuccas, the localities examined in 1893, still clearly marked by the displaced rubbish, were searched with great care. The fact that very few specimens were now secured in this previously worked area while the species were very common just outside its limits, is evidence that the specimens found on the ground under

The Family *Xantusiidae*

the dead branches were in their true diurnal home, and not mere stragglers from the living yuccas.

"The specimens were all caught alive and put into a large glass bottle, but were soon killed by the heat, although care was taken to keep them in the shade as much as possible. Count was kept as the lizards were placed in the bottle, and showed later that several more were taken out than had been put in. This may have been due to a mistake in the record, but was more probably caused by the birth of young after capture. The adults were afterward carefully examined and three were found to contain young, showing that the species is ovoviparous. One of the three contains two fœtuses, and the others have one each. These fœtal specimens are about the size of the young found under the dead branches.

"Hesperia, Cal., Sept. 26th, 1894. *Xantusias* were very abundant. Young were as numerous as at Mojave, Sept. 17-18, 1894, and the habits observed were the same as recorded there.

"Cabazon, Cal., Sept. 28, 1894. A single specimen, secured after several hours searching, was shaken from the dry leaves of a dead but still standing yucca about two feet high."

Cope's Lizard, *Xantusia picta*, Cope.—In his description of this lizard, Cope explains that it may be recognised by its proportionately longer limbs and tail, and by the colouration. It is most nearly allied to *Xantus's* Lizard.

Colouration.—Light, pinkish gray, with two rows of large, purplish brown spots, which are separated by narrow lines of ground-colour. The tail is similarly marked with smaller spots—these farther apart.

Dimensions.—Total length, $4\frac{1}{4}$ inches; tail, $2\frac{1}{4}$ inches.

Distribution.—One specimen known; from Tejon Pass, southern California.

Gilbert's Lizard, *Xantusia gilberti*, Van Denburgh, has a scalation rather similar to the preceding species, but there are two frontal plates, instead of a single frontal. The eye is much smaller than that of the preceding.

Colouration.—Above dark, brownish clay colour, dotted with black on single scales or granules. A pale brownish band, the width of two scales or granules, extends backward on each side of the neck, from the head shields; it becomes obscure on

The Family *Xantusiidae*

the back, but may be again discerned over the thighs. The abdomen is yellowish white.

Dimensions.—Total length about 3 inches; tail, $1\frac{1}{2}$ inches.

Distribution.—One specimen known and taken at San Francisquito, Sierra Laguna, Lower California.

Henshaw's Lizard, *Xantusia henshawi*, Stejneger, differs from the species already described in having fourteen (longitudinal) series of plates on the abdomen. The eye is large.

Colouration.—Blackish brown above, irregularly marbled with cream-coloured lines; on the tail these show a tendency to form cross-bands. White beneath.

Dimensions.—Total Length... .. $5\frac{3}{8}$ inches.
Length of Tail... .. $3\frac{1}{8}$ "

Distribution.—The species has been found only at Witch Creek, San Diego County, California—in the chaparral belt.

Habits.—Concerning the habits, Mr. Van Denburgh remarks:

"Here this species lives among the numerous granite boulders, and comes out into the narrower crevices between them a few minutes before dark. It is, therefore, practicable to hunt for it only about fifteen or twenty minutes each day. If a bit of string or a straw be introduced into the domain of one of these lizards it will often be seized, the reptile apparently mistaking it for some stray insect."

Rivers' Lizard, *Xantusia riversiana*, Cope.—The largest species. Differs from the others in having *two* series of small plates over the eye and the plates of the abdomen in sixteen (longitudinal) series.

Colouration.—Gray or brown with irregularly-scattered brown or black spots. On some specimens the spots fuse into lines.

Dimensions.—Total Length... .. 7 inches.
Length of Tail... .. $3\frac{1}{2}$ "
Length of Front Limb... .. $1\frac{1}{8}$ "
" Hind " $1\frac{1}{2}$ "
Length of Head... .. $1\frac{5}{8}$ "

Distribution.—San Clemente, San Nicholas and Santa Catalina Islands, off coast of California.

CHAPTER XXI: THE STRIPED LIZARDS OR "RACE RUNNERS"

FAMILY TEIIDÆ—GENUS CNEMIDOPHORUS

THE *Teiida* is a fair-sized family of lizards and its members are confined to the New World. The majority occur in Central America, South America and the West Indies. Some attain a large size. The family is most nearly allied to the Old World *Lacertidæ*. Species of but one genus are found in North America.

The Genus *Cnemidophorus*.—The Striped Lizards or "Race Runners." Collectively, these lizards may be readily recognised. They are slender and graceful in build, with strong limbs, long and gradually tapering tail, and rather pointed head. The upper portion of the head is covered with large, symmetrical shields; the scalation of the upper part of the body is very fine and granular; beneath, the body is plated, in alligator-like fashion; the tail is covered with rings of coarse scales. Strongly forked at the tip, blackish and snake-like, the tongue is a useful organ and frequently employed in examining the ground over which the creature walks.

It is by the colouration that the species *generally* may be readily recognised. The ground-colour is olive or brown; extending from the back of the head to the base of the tail are narrow, but sharply defined yellow stripes, from four to six in number—*on young examples*.

With maturity, some of the species lose the stripes and become spotted or cross-banded.

The Striped Lizards are among the most familiar reptiles of the southern United States and northern Mexico. An abundant species occurs in the East; the Southwest is rich in species. These lizards are strictly terrestrial. They frequent dry and open places exposed to an all-day glare of the sun. Here they literally skim over the ground when startled. So great is their activity in running that the human eye is unable to follow the progress of the smaller individuals beyond tracing a blurred

The Striped Lizards or "Race Runners"

streak over the ground. When the animal terminates its dash for safety, it stops so abruptly that it seems to vanish.

In the preparation of a resumé of the species of *Cnemidophorus*, the writer finds himself confronted by the most difficult proposition of any yet encountered in this work. Provided with a fine series of specimens, he has attacked the obstacle from every side—and with little success. For this genus he is unable to construct a popular key and he will not presume to offer any but concise descriptions of the alleged species. To go into detail would be to construct descriptions that could be comprehended only by the most advanced technical worker. The definition of the species is the greatest puzzle of North American herpetology. American writers have undoubtedly expended an excess of energy in naming species and subspecies—varieties. Single specimens have been provided with full specific names and the descriptions have been founded upon petty characters of pattern or scalation. Among lizards where a certain amount of variation is marked, this course seems altogether unwise. Foreign writers have worked in such extreme opposition that a comparison of the two methods is quite bewildering. Nothing can straighten out this problem but the work of some one who makes a specialty of the genus, gathers about him elaborate series of all the species (?) and notes his observations impartially.

The student should remember, in examining the list that follows, the characteristic of some species in retaining a striped pattern through life, and the loss of the stripes and consequent marbled or cross-banded pattern of others.

The **Cape Striped Lizard**, *Cnemidophorus hyperythrus*, (Cope).—This, and the succeeding lizard, *C. sericeus*, may be told from the other species by the scalation of the head. Behind the central region—between the eyes—is a single plate, a condition technically described as "frontoparietal plates fused together." It has been employed to establish a separate genus—*Verticaria* of Cope. The other striped lizards have this plate divided. (See illustrations).

Colouration.—Light brown or olive above; sides black. Two yellow stripes on each side and two pale stripes on the

The Striped Lizards or "Race Runners"

back. Abdomen red. Appears to retain the striped pattern through life.

Attains a length of eight inches; tail $5\frac{1}{2}$ inches.

Distribution.—The peninsula of Lower California, and as far north as San Diego, California. An abundant lizard.

Van Denburgh's Striped Lizard, *Cnemidophorus sericeus*, (Van Denburgh).—Closely allied to the preceding, as it has a single plate behind the frontal—between the eyes.

Colouration.—Dark brown above, with a central, bluish-white stripe, forking on the neck; two similar stripes on each side. Sides much paler than the back. Abdomen bluish.

Attains a length of about eight inches.

Distribution.—Recorded from San José Island, Gulf of California.

The Large Striped Lizard, *Cnemidophorus maximus*, (Cope).—This, and all of the succeeding North American species of *Cnemidophorus*, have a pair of plates behind the large frontal—between the eyes.

Largest species of the genus; grows to a length of two feet and occasionally longer. Plates of the abdomen in eight rows. Scallation of the back exceedingly fine.

Colouration.—Olive brown above, with three brown bands on each side, about as wide as the intervals between them; these are often so broken by spots of the ground-colour as to resemble rows of light spots or confluent variations of the ground-colour. (Cope).

Upper surface of tail and sides of neck black. Shields of the abdomen tipped with black. Under surface of tail and hind limbs, bright yellow.

Old specimens are so strongly barred with light and dark hues that the pattern lacks all traces of stripes. The young have strongly defined and uninterrupted light and dark bands.

Distribution.—The Cape Region, Lower California.

The Tessellated Lizard, *Cnemidophorus tessellatus*, (Say).—Attains a length of sixteen inches. Differs from the large striped lizard by the coarser scales on the back, the narrow and brighter stripes and its smaller size.

Colouration.—Young, dark olive, with four to seven pale yellow stripes on the back and sides, which are narrower than the dark spaces between them. As the lizard grows larger, a

The Striped Lizards or "Race Runners"

row of yellow dots appears on each dark area between the stripes; these spots finally fuse across the dark area and into the lines, entirely breaking up the striped pattern and bringing about an effect of wavy and narrow, yellow *cross-bands*, alternating with dark ones; as the alternate light and dark patches are fine and irregular, the effect is a marbled or tessellated pattern—hence the technical name.

Variations.—Five varieties have been described, these relating to colouration. They appear to represent different stages in the colour metamorphosis, only. In some portions of the range the process seems to be incomplete; in others it continues to an extreme degree and the change from a striped example to one with a marbled pattern, is striking.

<i>Dimensions</i> .—Total Length	18	inches.
Length of Tail	12	"
Width of Head	1	"
Length of Head	1½	"
Length of Hind Limb	3½	"
" " Front "	2	"

Distribution.—Northern Mexico and southwestern Texas; New Mexico, Arizona, Nevada, Utah, eastern California and Lower California. Occurs most commonly in sub-arid regions and in the deserts.

Graham's Lizard; Tiger Lizard, *Cnemidophorus grabami*, (B. & G.). Differs from the tessellated lizard in the much coarser, light and dark markings. The limbs are vividly blotched.

Grows to a length of fourteen inches.

Distribution.—Apparently a rare lizard. Several examples have been taken in Texas, between Antonio and El Paso. A variety is recorded from Lower California.

The **Spotted Race Runner, *Cnemidophorus gularis*, (B. & G.).** Closely allied to the succeeding species, but each of the dark spaces between the stripes contains a row of pale dots or blotches on the adult; these dots do not encroach upon the stripes as is the case of the two preceding reptiles.

Snout considerably more pointed than that of the near ally—*C. sexlineatus*.

Colouration.—Brown, or olive, with six sharply defined yellow stripes; these are persistent through life. Young individuals are simply striped; as they grow older, a row of pale dots

The Striped Lizards or "Race Runners"

appears in each of the dark areas between the stripes; throat of the male, black.

Seven varieties have been named. Most of these are found in Mexico.

Dimensions.—Ten to twelve inches.

Distribution.—The form described is found in central and western Texas, New Mexico and Arizona. It is an abundant reptile.

The **Six-lined Lizard; Race Runner**, *Cnemidophorus sex-lineatus*, (Linn.).—One of the smallest species, attaining a length of about ten inches. Retains the striped pattern through life. The muzzle is considerably more blunt than of any of the other species.

Colouration.—Dark brown, with six bright yellow stripes, beginning at the head and running to the base of the tail, where they become less distinct, though the stripes of the sides may continue on the tail for about one-fifth its length. On the centre of the back, is a broad, pale brownish band, extending from behind the head to the base of the tail; it is about an eighth of an inch wide on a mature specimen.

Abdomen greenish or bluish.

<i>Dimensions</i> .—Total Length	9 $\frac{3}{4}$ inches.
Length of Tail	7 " "
Width of Head	$\frac{1}{8}$ " "
Length of Head	$\frac{3}{4}$ " "
Length of Front Limb	1 " "
Length of Hind Limb	2 " "

Distribution.—Extends over a large area. Found along the Atlantic Coast from Delaware, southward throughout Florida; westward to California. In the Central Region, it extends as far north as northern Nebraska.

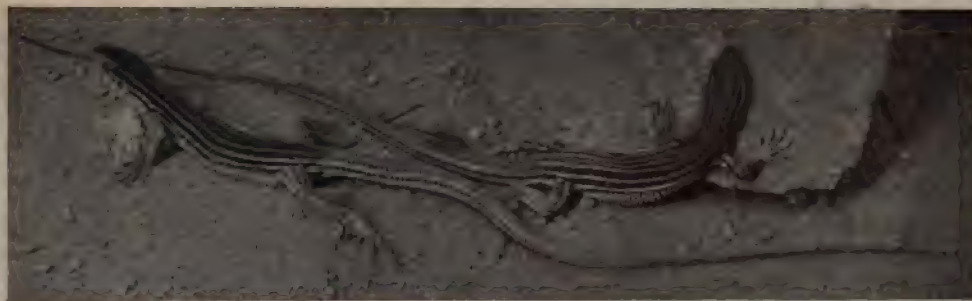
Cerros Island Striped Lizard, *Cnemidophorus labialis*, (Stejneger).—A small species, apparently striped through life.

"Nasal in contact with second supralabial; post nasal and first supralabial not in contact." (Stejneger).

Colouration.—Dark brown, with six pale lines; a central, clay-coloured band of same width as top of head. Abdomen white, or suffused with blue.

Dimensions.—Six to eight inches.

Distribution.—Cerros Island, off coast of Lower California.



SIX-LINED LIZARD: RACERUNNER, *Cnemidophorus sexlineatus*

The smallest species of a genus remarkable for the activity of its members. The present species retains the striped pattern through life



SPOTTED RACERUNNER, *Cnemidophorus gularis*

With the young the pattern consists of stripes. The adult has both stripes and spots



TESSELLATED LIZARD: WHIP-TAIL, *Cnemidophorus tessellatus*

Young individuals are striped. Note the entire change of pattern on the adult



TWO-FOOTED WORM LIZARD, *Bipes caniculatus*

Worm-like and practically blind, this degenerate lizard leads a subterranean life, burrowing long tunnels, through which it moves backward or forward.



FLORIDA WORM LIZARD, *Rhineura floridana*

A diminutive, worm-like species of the degenerate family Amphisbaenidae

The Striped Lizards or "Race Runners"

Habits of the Striped Lizards

Ground-loving reptiles, the "Race Runners"—as these lizards are often called—are among the most active of the North American lacertilians. They seldom show a desire to climb, but frequent dry, sandy places and the borders of dusty roads; they teem in the sub-arid plains of western Texas and occur in the deserts of the far West; in these places they dig burrows, in which to shelter at night. When pursued, they seemingly keep these locations in mind, for they speed over the ground and usually straight to a hole, darting into it with lightning-like activity.

That these fleet-footed creatures have keen eyes and wits the writer has many times noted. In chasing the Eastern species over sandy stretches—after heading a specimen away from furrowed ground—he has often seen a lizard turn, after pursuing a straight course, then rush at a speed equal to a man on a run, straight for the burrow of a mouse, or for a small thicket, and disappear in an instant. These lizards were abundant in the district where he collected for several weeks, but their activity was so pronounced, that barely a dozen specimens were captured alive.

The Race Runners show none of the changes of colour to be noted with many of our lizards. For the most part, they are insectivorous, but the adults are not averse to feasting upon the eggs of small birds that build their nests on the ground. The lizard cracks the shell with its strong jaws and laps up the contents, with the long, flat, forked tongue. All of the species lay thin-shelled eggs. The female scoops out a hollow in the sand, and, carefully covering the eggs, leaves them to be hatched by the sun's heat.

CHAPTER XXII: THE WORM-LIKE LIZARDS

The Families EUCHIROTIDÆ and AMPHISBÆENIDÆ, Embracing the Most Degenerate of the Lizards—Descriptions of the North American species

AFTER the consideration of the several families of agile and strong-limbed lacertilians that followed the glass "snakes" and their allies—*Anguidæ*, the student is again referred to a group of degenerate lizards, the majority limbless, which, instead of being serpentine in aspect as were the species of the *Anguidæ* and *Aniellidæ*, are distinctly *worm-like*. To the popular eye they are wholly unlike a reptile; moreover, their methods of locomotion at once suggest their lowly position in the scale of reptile life.

These lizards possess no scales, as is the case with other lacertilians. The integument is made up of narrow, ring-like segments, which add to the worm-like aspect. Most of the species are provided with large shields on the top of the head and on the chin. It is by means of the segments that these creatures progress. They are movable, and carry the reptile slowly forward or backward with equal facility. The segments are employed in sections, with wave-like movements that recall the crawling of a millepede, or the use of the "foot" muscles of a large snail that is observed upon a pane of glass. Frequently these lizards progress by a series of many slight, *vertical* undulations, which are always, however, largely assisted by the movements of the segments. In a subterraneous existence eyes are superfluous. The sense of smell and functions of the delicate and invaluable reptilian tongue are greatly developed. The entire integument is also extremely sensitive.

All of the species included in this chapter are burrowers and lead an underground life. They are practically blind, as the eyes are hidden under the skin and barely discernible.

The two families embracing these species may be easily separated, thus:

The Worm-like Lizards

Body worm-like. Integument in ring-like segments.	{ A pair of forelimbs <i>Euchirotidae</i> <i>Distribution</i> .—Lower California and Mexico.
	{ Limbless <i>Amphisbænidae</i> <i>Distribution</i> .—Southern North America; South America; southeastern Europe; Asia Minor and Africa.

The Two-footed Worm Lizards—Family *Euchirotidae*: The members of this family are very strange. They are worm-like, practically blind and subterranean in habits, *but possess one pair of well-developed limbs*. These limbs are on the anterior portion of the body and spring from what might be termed the throat of the creature. The well-developed toes, bearing *sharp claws*, tend to make this pair of limbs appear quite incongruous, in the case of such a degenerate, elongated reptile. At the same time, the strange characteristic renders these lizards at once distinguishable.

Three genera of the *Euchirotidae* are known—*Euchirotas*, of Lower California, *Bipes* and *Hemicbirotas*; both of the latter occur in Mexico. Cope has concisely separated these genera, as follows:

Toes five; all with claws	<i>Euchirotas</i> .
Toes five; one smaller and clawless	<i>Bipes</i> .
Toes three; all with claws	<i>Hemicbirotas</i> .

Each of these genera includes but a single species.

Like the members of the succeeding family of lowly reptiles, the Two-footed Lizards show the surface of the body to be divided into numerous rings, like the segments of an earthworm; these rings are in turn divided into minute, scale-like squares. There is a furrow on each side of the body, which has led some authorities to separate the segments into the "abdominal series" and the "dorsal series," which arrangement is valuable in detailed, technical description relating to superficial variations.

Some writers have included this family within the *Amphisbænidae* but the possession of the forelimbs is too strong a character to admit their presence in a family where the large number of species are without vestiges of limbs.

The Worm-like Lizards

As the three genera are so closely allied, but one species is described. The brief key, preceding, together with the following details and illustrations, should enable the student to readily identify the three representatives of the family.

THE TWO-FOOTED WORM LIZARD

Bipes caniculatus, (Lacépède)

Stout, and much like a very large earthworm in size and form. The head and tail are blunt and much the same in outline. The mouth is very small. On the top of the head and on the chin are numerous and symmetrically arranged scales or plates. The remainder of the body, as well as the tail is covered with narrow, shining rings, which are so lined as to be divided into minute squares. Buried under the skin and translucent scales of the head, the eyes may be faintly seen as obscure dots. They are practically of no use to the creature.

A short distance behind the head is a pair of small, though well-developed limbs which are very flat, and terminate in four well-formed toes; these are provided with moderately long and very sharp claws. There is a fifth and smaller toe, the same clawless.

The tail is about three times the length of the head.

Colouration.—Above (just half the circumference of the body) dull, purplish brown. The lower half is yellowish-white.

Dimensions.—The measurements given are from a specimen taken near the City of Mexico.

Total Length.	9	inches.
Length of Tail.	$1\frac{1}{2}$	"
Greatest Diameter.	$\frac{3}{8}$	"
Length of Limbs	$\frac{5}{16}$	"

Dimensions.—This species is confined to Mexico, as is the allied species known technically as *Hemichirotus tridactylus*, which has a very short tail—but little longer than the head. The third species of the family, *Euchirotus biporus*, appears to be restricted to Lower California, where it is recorded from La Paz.

Habits.—Beyond the fact that these creatures burrow in soft soil, feeding upon worms and insects, their habits are unknown.

The Worm-like Lizards

The Worm Lizards—Family *Amphisbaenidae*: Differing from the preceding family, which is small and covers but a limited area in its distribution, the *Amphisbaenidae* comprises some ten genera, these representing between sixty and seventy species which are distributed over extensive areas in both the New and the Old Worlds. Nearly forty species occur in the tropical latitudes of the Western Hemisphere; four inhabit the regions bounding the northern Mediterranean, and the remainder are African. But one species occurs in North America.

The largest genus of the family is South American—*Amphisbaena*. The majority of the species attain a length of about two feet and a diameter of about an inch. All are strictly subterranean, and though possessing but rudimentary eyes that are covered by translucent scales and skin, are not strictly blind, as they distinguish the presence of a hand waved over them and will endeavour to bite. Captive specimens are quite hardy, and while displaying a marked repugnance for the light, will live indefinitely in a box that provides no medium in which to burrow. They feed voraciously upon earthworms, slugs and small pieces of raw beef. A gentleman from whom the writer has received several specimens, explains that young individuals may often be exhumed from ant-hills.

A description is given of the only North American representative of this family.

THE WORM LIZARD

Rhineura floridana, (Baird)

This reptile is limbless and worm-like in form, with scarcely the diameter of a large earthworm, for which, at a glance, the creature might readily be mistaken. The body presents a ringed, segmented appearance. The head is of the same width as the neck and is covered with shields; it lacks the presence of external eyes and ears. Very coarsely ringed and corrugated, the tail is blunt and resembles the head in general outlines.

Colouration.—In life this species is of a uniform lavender, over which plays an iridescent bloom, varying in intensity in different degrees of light. Preserved specimens quickly fade to a pale and lustreless yellow.

Dimensions.—The measurements of an averaged-sized specimen are given:

The Worm-like Lizards

Total Length.....	8½ inches.
Length of Tail	1½ "
Greatest Diameter.....	½ "

Distribution.—The species appears to be restricted to Florida.

Habits.—Among the many and varied phases of reptile life existing in North America, the Worm Lizard appears to be the most rudimentary in structure and secretive in habits. Its helplessness above ground may be appreciated after the examination of a specimen, and the absence of the eyes is noted. The subterranean habits render sight unnecessary. Sluggishly boring long tunnels in soft ground, through which it wriggles its way forward or backward with equal ease, it searches for prey of a like helpless nature as itself—the soft-bodied larvæ of small insects, and small earthworms—an adult would rival the reptile itself in size.

Seldom venturing from the soil except after heavy rains, this creature's visits to the light are few and consist of an aimless wandering for a short distance and nosing over the ground for a suitable spot in which to begin a new burrow. When such is found the snout is called into play and the reptile bores its way down and out of sight in a manner very suggestive of an earthworm.

Specimens are often found during the ploughing season, when they are uncovered from a distance of about four or five inches, from beneath the surface.

In captivity the species is uninteresting, as it passes all of its time in hiding, if soil is provided, and soon dies if not given a medium in which to burrow. Few captive specimens can be induced to partake regularly of the grubs or worms that may be offered. If uncovered from their hiding places, and scratched with the finger, they wriggle about uneasily, often opening a diminutive mouth and assuming an amusing attitude of self defence. At such times the tail is elevated from the ground, and the tip held aloft in a manner that might cause the novice to readily mistake it for the head, which lies flat upon the ground.



FIVE-LINED SKINK; "SCORPION," *Eumeces quinquelineatus*

Young examples are black, striped with yellow, and have a brilliant blue tail. The adults become brownish, with a fiery red head. Until a comparatively recent time the young and adult phases were regarded as distinct species.



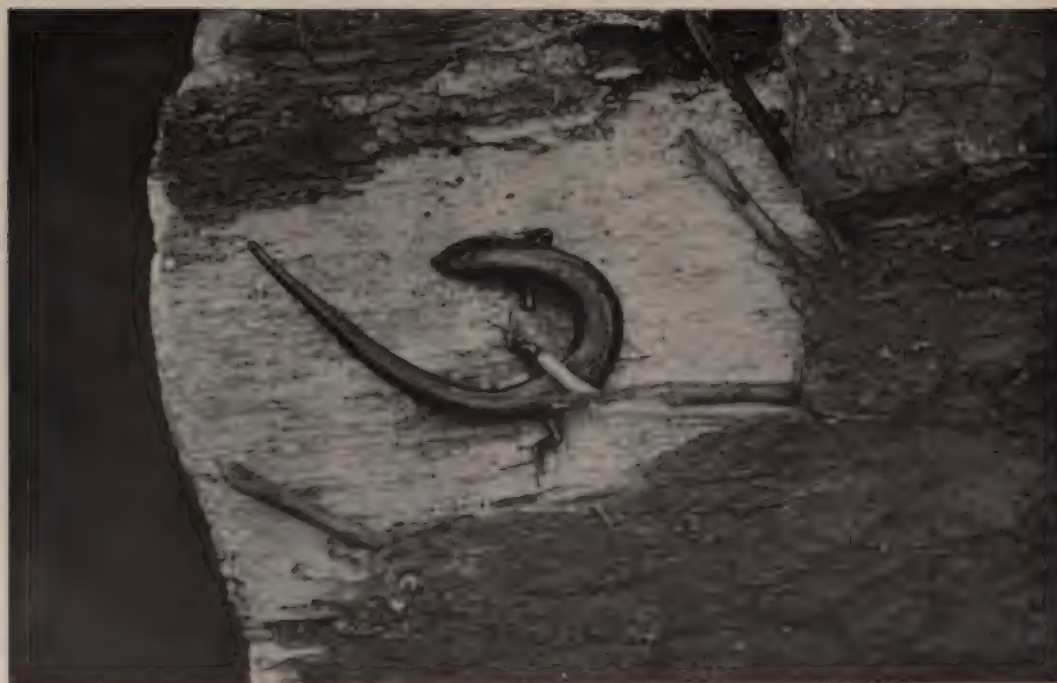
SKILTON'S SKINK, *Eumeces skiltonianus*

A distinct and handsome species of the Western States. The tail is brilliant blue.



FLORIDA SKINK, *Eumeces egregius*

Found only in the vicinity of Key West, Florida. The scales have a metallic lustre



GROUND LIZARD, *Lygosoma laterale*

This tiny lizard is common in the Southern States, living among leaves and under logs.

CHAPTER XXIII: THE SKINKS OR SMOOTH-SCALED LIZARDS

FAMILY SCINCIDÆ

Small, Glossy-scaled Lizards of a Large Family, Represented in North America by Two Genera and Fifteen Species

Classification and Distribution.—The *Scincidæ* is one of the largest families of the lizards and its members occur abundantly in both the Eastern and the Western Hemispheres. The largest number of species inhabit the Old World. The family is richly represented in Australia.

The Skinks are of small or moderate size and usually have smooth—generally shining scales. The scalation is quite hard as the scales cover bony plates.

Like the *Anguidæ*, the Skinks present interesting phases of evolution. Most of the species have short limbs but are agile runners; others are serpent-like in body and have extremely minute limbs with which they drag the body when progressing leisurely, but in time of danger fold them against the sides and glide away like a snake; some have a minute pair of forelimbs only, and a few have but a pair of useless hind limbs. A number are limbless and snake-like.

The North American species have well-developed limbs and are very agile. Two genera are represented in the United States, namely: *Eumeces*, with fourteen species, and a single species of *Lygosoma*. All of these species are of small or very moderate size, with smooth, shining scales. Their glossy aspect at once distinguishes them from other lizards. Of the two genera, *Eumeces* is the smaller; it contains about thirty species, the majority inhabiting the New World: the others are found in Africa and Asia. *Lygosoma* is a large genus, containing over 160 species; these are generally distributed throughout the temperate and tropical portions of the globe and among them

The Skinks or Smooth-scaled Lizards

are many of the forms with minute and comparatively useless limbs.

In preparing popular descriptions of the North American Skinks, the writer finds himself confronted by a difficult proposition, as old individuals of most of the species fade to a dull, olive hue with little or no trace of pattern. Most of the young are vividly striped and the pattern is retained well into maturity.

The following arrangement of the species is the writer's only alternative unless he plunges into a mass of what would be to the beginner, a confusing mix-up of technical details:

Division A. Eight pale lines on a darker ground-colour.

Many-lined Skink, *Eumeces multivirgatus*, (Hallowell).—Limbs small and far apart; the length of the hind limb applied twice forward, fails to reach the base of the front limb. Twenty-four to twenty-six rows of scales round the body.

Colouration.—A broad, central olive band, bordered on each side by five dark brown, and four pale olive stripes; first and fourth of the dark stripes the widest.

Distribution.—The Central States. Nebraska to Kansas; Mississippi Valley to the Rocky Mountains.

Division B. 5 pale lines on a dark ground-colour.

Five-lined Skink, *Eumeces quinquelineatus*, (Linn.).—The common species of the Eastern and Central States. It attains a length of ten inches. Owing to the two distinct phases of colouration—the young and the adult—it is known under several popular names.

There are 28—34 rows of scales round the body. The body is moderately stout; the length of the hind limb applied twice forward reaches beyond the ear.

Colouration.—Very young specimens are jet-black, with a vivid yellow line on the back and two similar lines on each side. The central stripe forks on the head. These five stripes extend to the tail, where they are lost in a shade of brilliant blue. This young phase is popularly called the Blue-tailed Lizard and the Five-lined Lizard; it is represented by specimens 4-5 inches long.

The **Red-headed Lizard** or "Scorpion" is the adult phase. As the creature grows older, the black gives way to a dull brown

The Skinks or Smooth-scaled Lizards

and the stripes rapidly fade; those on the sides are the longest to remain well defined. Female specimens retain dull stripes through life, but the males become a *uniform, dull olive-brown on the body and bright red about the head*. With maturity the head becomes very wide and swollen at the temples.

The transformation from a coal-black, vividly striped lizard having a brilliant blue tail, to a plain, brownish creature with a bright, reddish head, has incited some technical writers, who have not appreciated the exact conditions, to name two distinct species. (See illustrations).

Dimensions.—Following are the measurements of a fair-sized specimen of the "Red-headed" Lizard—the adult phase of the species:

Total Length	9½ inches.
Length of Tail	5 "
Greatest Diameter	1 "
Width of Head (temples)	1½ "
Length of Front Leg	1¾ "
" " Hind "	1¾ "

These measurements are from an example taken near Savannah, Georgia. It is only in the Southern States that the species attains such large proportions. North of South Carolina the size is moderate and in the Virginias, Pennsylvania, New York and New Jersey the average length of adult specimens is about six inches.

Distribution.—The species occurs from Massachusetts to Florida and westward to central Texas. It is rare in the Northern States. The writer has taken occasional specimens in Connecticut. In New Jersey it is more common. Throughout the dry, pine woods of South Carolina, Georgia and Florida it abounds, attains the largest size and undergoes the most complete colour metamorphosis.

Habits.—Described at the end of the list of species.

Hayden's Skink, *Eumeces leptogrammus*, (Baird). Similar to the preceding, but has a lesser number of scale rows—24 to 26. The young are black, with five *dotted* lines; tail blue. Adult olive.

Dimensions.—A small species, attaining a total length of about six inches.

The Skinks or Smooth-scaled Lizards

Distribution.—The Central Region—Nebraska to northern Texas.

The Sonora Skink, *Eumeces obsoletus*, (Baird and Girard). A large species, attaining a length of 11 to 12 inches. Scales in 26 to 28 rows round the body. Limbs short; twice the length of the hind limb carried forward reaches only to the base of the arm.

Colouration.—Young black with five *very faint stripes*. Adult yellowish, or olive; margins of the scales darker; head reddish.

Distribution.—Kansas and central Texas, to Utah and Arizona; northern Mexico.

Division C. Four pale lines on a darker hue.

Skilton's Skink, *Eumeces skiltonianus*, (Baird and Girard). Attains a length of six to seven inches. Scales in about twenty-six rows. Twice the length of the hind leg applied forward reaches between the base of the foreleg and the ear.

Colouration.—Young olive, with two whitish lines on each side, embracing a dark band. The upper stripes are bordered by a black band (very narrow). Adults olive, with fainter stripes.

Dimensions.—Total length, $5\frac{7}{8}$ inches; tail, $3\frac{1}{2}$ inches.

Distribution.—The Pacific Region. Vancouver Island and extreme southwestern Canada, Washington, Oregon, California, western Nevada and Lower California to Cape St. Lucas. An abundant species.

Gilbert's Skink, *Eumeces gilberti*, (Van Denburgh). Structural characters like Skilton's Skink, but the colouration is different.

Young dark brown above, the scales with pale centres. Four pale lines, the lower not distinct, between ear and base of forelimb. The upper lines are broader than with Skilton's Skink and closer together.

Adult brownish olive, tinged with red; head bright red. No traces of stripes. Scales often with green centres.

Dimensions.—Larger than its near ally. Total length, $8\frac{1}{2}$ inches; tail, $5\frac{3}{8}$ inches.

Distribution.—"Western slope of the Sierra Nevada in the vicinity of the Yosemite Valley, California." (Van Denburgh).

Habits.—Mr. Van Denburgh explains that the species is

The Skinks or Smooth-scaled Lizards

very active, and is found in grass and fallen leaves, retreating to holes under stones and boulders.

The **Black-banded Skink**, *Eumeces septentrionalis*, (Baird). Size moderate. Scales in about 28 rows. A pair of white stripes on each side, embracing a black band. *Four black stripes on the back*, the two outer of these bordering the upper of the white stripes.

Distribution.—The Central Region—Minnesota and the Dakotas to Kansas.

The **Florida Skink**, *Eumeces egregius*, (Baird). Smallest and most elongated species of the genus inhabiting the United States. Body and tail cylindrical, almost worm-like; limbs small and weak. Ear opening minute. Scales in 22 rows round the body.

Colouration.—Olive to reddish brown. Four, equally distant white stripes—two on each side of the body and traversing the centres of single rows of scales; the stripes are margined with obscure, dotted lines.

Attains a length of three and a half to four inches.

Distribution.—Southern Florida and the Keys.

The **Black Skink**, *Eumeces anthracinus*, (Baird). Attains a length of about six inches. The scales are in 24 rows around the body. Form elongated and cylindrical.

Colouration.—Dark, olive green on the back; two distinct white lines on the sides. In the centre of each pair of stripes and bordering them above, is a coal-black band. Olive below the lower stripe. There is no marked difference between the young and the adult; the head of the adult is reddish.

Dimensions.—Total length, 5½ inches; tail, 3¼ inches.

Distribution.—Most abundant in the Alleghanean region; occurs from Pennsylvania to Texas.

The **Texas Skink**, *Eumeces tetragrammus*, (Baird). Form and colouration similar to the preceding, but the scales are in 26 to 28 rows.

Olive above, with two greenish stripes on each side; darker between the stripes. The stripes are separated by six rows of scales, instead of four, as is the case with *E. anthracinus*. Some specimens are black with very obscure stripes.

Attains a length of 6 to 7 inches.

Distribution.—Known only from Texas and northern Mexico.

The Skinks or Smooth-scaled Lizards

The **Pluvial Skink**, *Eumeces pluvialis*, (Cope). Form rather stout; scales in 26 rows round the body. Size moderate.

Dark olive, almost blackish above; two green stripes on each side, these separated by a black band. Rich green beneath.

Distribution.—One specimen known. Taken near Mobile, Alabama.

Cope's Skink, *Eumeces pachyurus*, (Cope). A moderate-sized and very elongate species. Scales in 26 rows round the body. The tail is very long and almost as thick as the body for a considerable distance. Limbs small and widely separated.

Colouration.—Light brown above. A dark brown band on each side of the body bordered with pale lines; the pair of pale lines narrowly bordered above and beneath with dark brown. Abdomen greenish.

Dimensions.—Length of Head and Body..... $3\frac{1}{8}$ inches.
 " " Front Limb. $1\frac{9}{16}$ "
 " " Hind " $\frac{3}{4}$ "

Distribution.—One specimen known; from Texas.

The **Short-lined Skink**, *Eumeces brevilineatus*, (Cope). A very slender, long-tailed species. Scales in 26 rows.

Lead-coloured above, with two pale lines on each side, extending from the side of the head to a short distance beyond the base of the fore limb. One of the lines extends along the upper lip and backward; the other begins at the end of the snout and runs backward over the eye.

Dimensions.—Total length, $5\frac{3}{4}$ inches; tail, $4\frac{1}{8}$ inches.

Distribution.—Texas. Has been taken near San Antonio.

Division D. No pale stripes.

The **Blue-spotted Skink**, *Eumeces guttulatus*, (Hallowell). A small species. The length of the hind leg applied twice forward reaches the ear. There are thirty scale rows round the body.

Colouration.—Young specimens entirely black on the body, the end of the tail becoming bluish. A row of bluish-white spots over the eye and a similar row along the upper lip; also a row on each side of the chin. With maturity the black gives way to olive and the spots become fainter.

Attains a length of about six inches.

Distribution.—Western Texas, New Mexico and Arizona.

The Skinks or Smooth-scaled Lizards

Habits of the Species

The habits of the various species of *Eumeces* are so similar that the writer simply gives his observations of the Blue-tailed Skink (Red-headed Skink).

This lizard is so difficult to capture that species of other genera, rarer and more restricted in *habitat*, are the most frequently seen in captivity. While collecting in the South in mid-summer, with Red-headed Lizards or "Scorpions" abundant on all sides, the writer succeeded in procuring less than a dozen living examples during two weeks' time, although every device from a fine snare of copper wire to a baited hook was tried. They would allow one to approach to within a distance of about ten feet, then scurry for cover. The reptiles invariably bask or hunt for insect prey within a short distance of secure hiding places, such as a burrow under a fallen tree or a cavity in the trunk itself. Unlike many species of lizards that run for an indefinite distance when disturbed, then stop and peer back at the object of their fright, the Skink flashes out of sight at the slightest shadow. As it emerges from its burrow, it looks cautiously about to ascertain whether all danger is past and the movement of a finger will send it back again.

Interested in studying the transition of colour from the young to the adult phase, the writer went again to the collecting grounds, but in the early spring when the nights were cold and the lizards were yet seeking their hibernating quarters, after the sun had gone down. Much time was given to stripping the bark from dead trees and during the process large numbers of snakes and lizards were obtained. These were snugly buried in the soft, rotting wood beneath the bark in the company of centipedes, scorpions and ants. On the second trip there was no difficulty in collecting large numbers, though no time could be wasted when a specimen was once exposed in its hiding, as the creature would endeavour to rush to the bottom of the tree trunk and burrow in the debris beneath it. Within ten days over two hundred of the desired examples were taken, showing all phases of the colour variation from the young individual to very old specimens. With the rapid development of the Southern spring, came increasing activity of the reptiles and before the writer left for the North, the capture of a "Scorpion," would have been a difficult matter as the lizards no longer sought shelter

The Skinks or Smooth-scaled Lizards

in decaying logs, but were living in their summer holes in the tree trunks.

Although gradually changing its colours and pattern with age, the Skink shows none of the momentary, varying hues, so commonly observed among the North American species of *Iguanida*—the "Chameleon," the Swifts and Horned "Toads."

The Skink is strictly diurnal, seeking its hiding place with the setting of the sun. The food consists largely of insects, but well-grown specimens will feed upon the eggs of birds, or newly born wood mice, often discovered by the lizard as it investigates the crevices of fallen trees. Provided with strong jaws, the adult males bite vigorously if handled and, retaining their hold with considerable tenacity, inflict a painful squeeze. If grasped by the tail, they instantly twist off that appendage. When thus unhesitatingly discarded, the bright blue tail of the younger specimens, wriggles in such an energetic manner that the brilliant, writhing object will often engross the captor's attention for the instant that it takes the original owner to find a hiding place.

During observations on a large series of captive specimens, the writer noted a characteristic that appears unique among lizards. Several large strips of bark has been placed upon the gravel of the cage, to form hiding places. On lifting these strips of bark to examine the specimens, a number of the lizards were found lying in circular, coiled positions, a most unusual attitude for lizards to assume. Upon closer inspection it was discovered that each of these reptiles was a female lizard coiled about her eggs. The number of eggs to each example was three or four.

These lizards remained in their curious positions until immediately prior to the eggs' hatching, ignoring the bright sunshine in which their companions basked and sported, and, during the several weeks' time, taking no food. When the young emerged they paid no attention to them, and the little creatures seemed fully able to shift for themselves. This guarding of the eggs, if such it were, is rarely seen among reptiles. The pythons coil about their eggs until the time of hatching, but the vast majority of snakes and lizards are quite indifferent to the condition of the eggs after they have been carefully deposited. The female alligator is alleged to protect her nest by remaining

The Skinks or Smooth-scaled Lizards

constantly by it, but no guardian parent was ever seen in the vicinity of the 'gator nests collected by friends of the writer or himself.

As the eggs of the Skink hatch quickly as compared with those of many lizards and snakes, these reptiles may be said to stand midway between the strictly *oviparous* species and those which produce the young alive. In their reproductive habits, lizards may be separated into three groups: 1. The strictly *oviparous* species. 2. Those which deposit eggs with a *thin* integument, containing rapidly developing embryos, and 3. The truly *viviparous* forms, producing fully developed, living young, like the species of *Phrynosoma*—Horned "Toads."

The **Brown-backed Skink; Ground Lizard, *Lygosoma laterale***, (Say), is a diminutive, elongated and cylindrical lizard, with minute limbs, and looks more like the smaller species of salamander than a true lacertilian. The tail is long and almost as thick as the body at its basal third.

Colouration.—Back, and upper portions of tail and head bronze, sometimes olive, with minute dots—on the body—in lines. On each side of the bronze area, is a dark band. The abdomen is yellowish.

Dimensions.—Total Length 3 inches.
Length of Tail $1\frac{1}{2}$ "
Diameter of Body $\frac{1}{4}$ "

Distribution.—In the eastern United States the species ranges from southern New Jersey southward throughout Florida; in the Central States it occurs as far north as southern Illinois. It ranges westward to central Texas, thence southward into Mexico.

Habits.—While hunting for this miniature reptile the writer has always noted that it is very secretive in habits—in fact leads a burrowing life. Large numbers of specimens were found under the loose bark of fallen trees. When uncovered they displayed considerable agility, half running, half wriggling away in a series of rapid, lateral undulations to disappear among dead leaves or burrow their way into mould or wood-pulp. The snappy, undulating movements assist the lizard to a great extent in its locomotion, as the limbs are too short to be of use in actual running. Many times has the writer mistaken these reptiles

The Skinks or Smooth-scaled Lizards

for the small salamanders—*Spelerpes* or *Plethodon*. If they are grasped by the tail, they turn quickly, twisting that member from the body and leaving it as a wriggling souvenir while the lizard wastes no time in scurrying to shelter. Ultimately, a new tail is grown, but it is always shorter than the original.

Very few specimens were actually seen abroad, and these were exceedingly timid, darting into the leaves and grass upon the slightest disturbance. Although well protected by its sombre hues, these closely matching the ground, the Brown-backed Lizard has many enemies in the shape of snakes, particularly the young of the genus *Ophibolus*; the Scarlet Snake (*Cemophora*), also feeds largely upon it.

The Ground Lizard thrives in captivity if provided with an abundance of the proper food—ants and their larvæ and the grubs of the smaller wood-boring beetles. As most specimens pass their time in hiding they are poor subjects for purposes of observations.

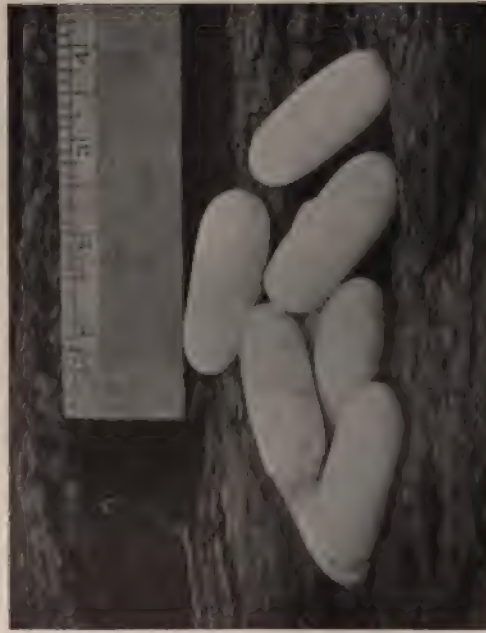
PART IV.
THE SNAKES
Order OPHIDIA



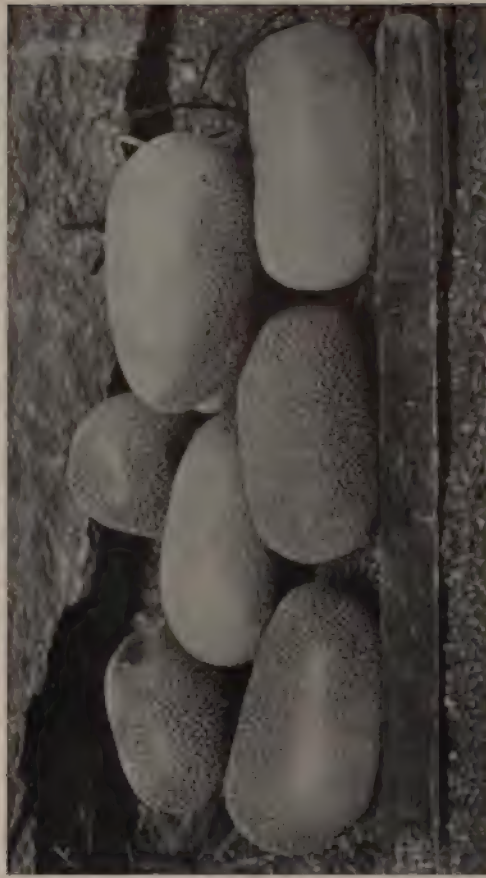
Eggs of the Bull Snake, *Pituophis 10yi*



Eggs of the Rainbow Snake, *Ahaetia erythrogrammus*



Eggs of the Blacksnake, *Zemopsis constrictor*

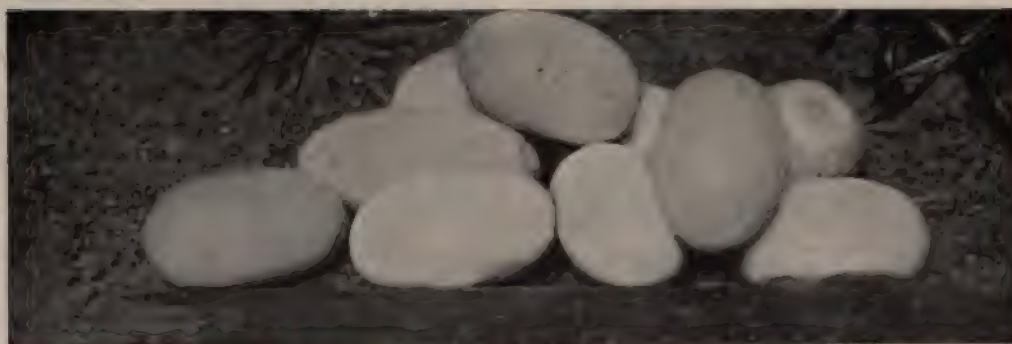


Eggs of the Gopher Snake, *Spilotes caroli couperi*

EGGS OF NORTH AMERICAN SERPENTS



FOX SNAKE, *Coluber vulpinus*, AND HER EGGS



EGGS OF THE CORN SNAKE, *Coluber guttatus*



EGGS OF THE GREEN SNAKE, *Liopeltis vernalis*



MILK SNAKE, *Ophiodon dolius triangulus*, AND HER EGGS

BREEDING HABITS OF SNAKES

CHAPTER XXIV: CLASSIFICATION OF THE NORTH AMERICAN SNAKES

*North America is Rich in Serpent Life, as Will be Seen From the
Following Classified List: §*

Order Ophidia			
FAMILY	SUBFAMILY ETC.	GENUS	NORTH AMERICAN SPECIES
GLAUCONIDÆ			
	(Blind Snakes).....	<i>Glauconia</i>	2 Species Burrowing a.
BOIDÆ	{ Boinæ, Boas	<i>Lichanura</i>	2 " Terrestrial b.
		<i>Charina</i>	2 " "
COLUBRIDÆ	{ I. Aglypha: all the teeth solid—not grooved or perforated. The Harm- less Snakes.	<i>Eutaenia</i>	11 " "
		<i>Tropidonotus</i>	13 " Semi-aquatic c.
		<i>Clonophis</i>	1 " Burrowing
		<i>Tropidoclonium</i>	1 " "
		<i>Seminatrix</i>	1 " "
		<i>Liodytes</i>	1 " "
		<i>Storeria</i>	2 " Secretive d.
		<i>Amphidaris</i>	1 " "
		<i>Haldea</i>	1 " "
		<i>Virginia</i>	2 " "
		<i>Spilotes</i>	1 " Terrestrial
		<i>Zamenis</i>	4 " "
		<i>Salvadora</i>	1 " "
		<i>Phyllorhynchus</i>	2 " "
		<i>Coluber</i>	5 " "
		<i>Rhincheilus</i>	1 " "
		<i>Pituophis</i>	3 " "
		<i>Cyclophis</i>	1 " A boreal c.
		<i>Liopeltis</i>	1 " Terrestrial
		<i>Hypsiglena</i>	1 " "
		<i>Stilosoma</i>	1 " Burrowing
		<i>Rhadinea</i>	1 " "
		<i>Contia</i>	1 " Secretive
		<i>Diadophis</i>	3 " "
		<i>Ophibolus</i>	7 " Terrestrial
		<i>Abaster</i>	1 " Burrowing
		<i>Farancia</i>	1 " "
		<i>Carpophis</i>	1 " "
		<i>Ficinia</i>	1 " "
		<i>Chilomeniscus</i>	2 " "
		<i>Cemophora</i>	1 " "
		<i>Rhinocheilus</i>	1 " Terrestrial
		<i>Heterodon</i>	3 " "

§Boulenger's system has been used.

Classification of the North American Snakes

FAMILY	SUBFAMILY ETC.	GENUS	NORTH AMERICAN SPECIES	
COLUBRIDÆ (concluded)	II. Opisthoglypha: One or more pairs of grooved fangs in rear of upper jaw.	<i>Trimorphodon</i> ...	1 Species	Terrestrial
		<i>Sibon</i>	1 "	"
		<i>Erythrolamprus</i> ..	1 "	"
		<i>Tantilla</i>	4 "	Burrowing
	Dipsadomorphinæ..			
	III. Proteroglypha: A pair of short, erect, perforated fangs, in front of upper jaw.			
	Elapinæ....	{ <i>Elaps</i>	2	
	This subfamily embraces the Cobras and their allies in the Old World, and the Coral Snakes in the New World.			
VIPERIDÆ	Crotalinæ.. A pair of long fangs folding against roof of mouth when jaws are closed.	<i>Ancistrodon</i>	2 "	1 Terrestrial
		<i>Sistrurus</i>	2 "	1 Semi-aquatic
		<i>Crotalus</i>	11 "	Terrestrial
				"

Total number of species: 111.

Explanatory: a. Signifies that the reptile leads a burrowing or subterranean life.

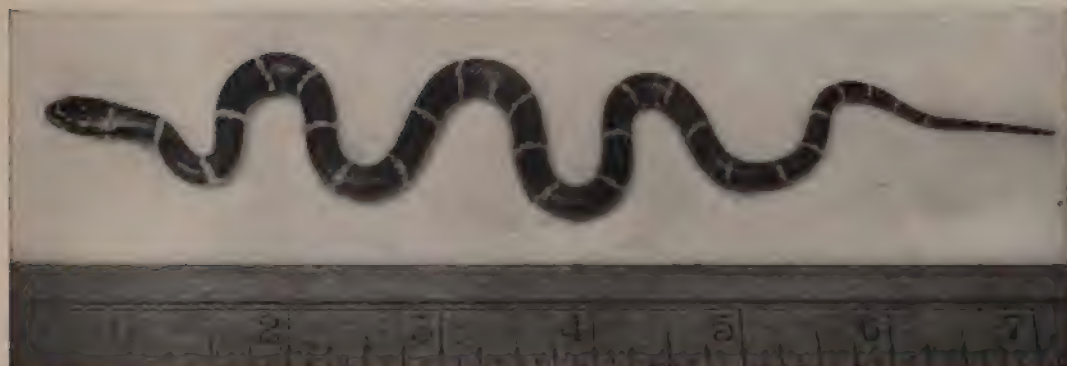
b. *Terrestrial* snakes are those species that prowl above ground in search of their prey.

c. *Semi-aquatic* reptiles are those that frequent the borders of ponds and streams

d. By the term *secretive*, we may signify those snakes that are not often found prowling; they search for their prey in stone-piles or under the loose bark of decaying trees.



RAINBOW SNAKE, *Abastor erythrogrammus*



KING SNAKE, *Ophibolus getulus*

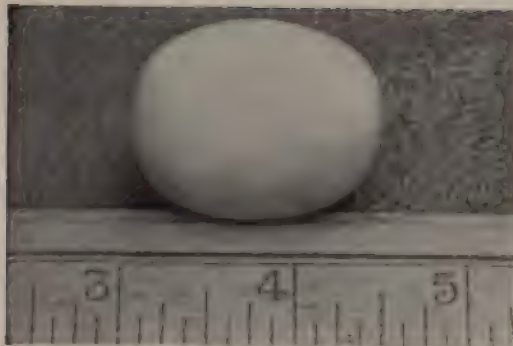


HOG-NOSED SNAKE, *Heterodon platyrhinus*

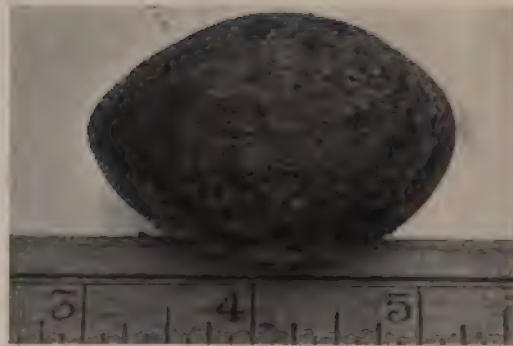


CORAL SNAKE, *Elops fulvius*. (Venomous.)

BREEDING HABITS OF SNAKES. FRESHLY HATCHED EXAMPLES OF OVIPAROUS SERPENTS



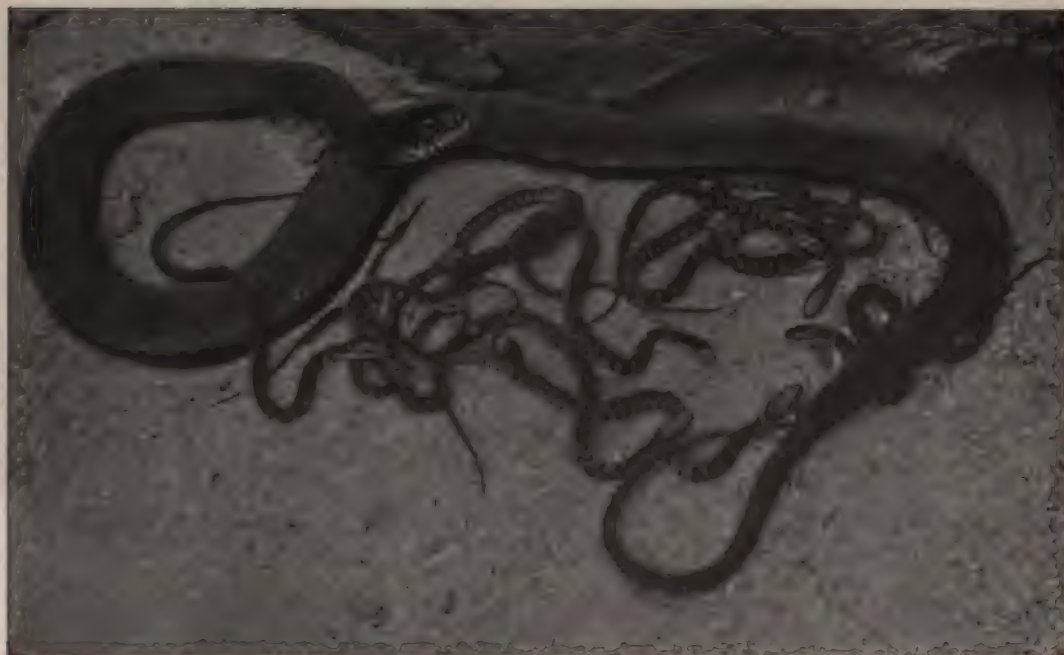
Egg of Fox Snake, *Coluber vulpinus*, at time of deposit



Same egg seven weeks later—immediately before hatching



Eggs and freshly hatched young of Ring-necked Snake, *Diadophis*



A viviparous snake and her newly born brood of young—the Common Water Snake, *Tropidonotus fasciatus ripodon*

BREEDING HABITS OF SNAKES

CHAPTER XXV: THE BLIND SNAKES; FAMILY *GLAUCONIIDÆ*, AND THE DWARF BOAS; FAMILY *BOIDÆ*

A Few Northern Representatives of Tropical Families

BOTH of the families embraced in this chapter are essentially tropical. Of the Blind Snakes—*Glauconiidæ*, two typical representatives extend northward from Mexico into the extreme southern United States. Of the *Boidæ*—the family of great constrictors (Boas and Pythons)—four small, rather degenerate species are found in North America. In form and habits these families are widely different, but both show vestiges of a pelvis and hind limbs. With the *Glauconiidæ*—though the rudiments of the pelvic girdle and the hind limbs are most pronounced of any living snakes—the hind limbs are quite concealed. On most of the species of *Boidæ*, the rudimentary hind limbs are visible externally, as claw-like spurs; these protuberances are movable and represent the tip of the limb.

The Blind Snakes—Family *Glauconiidæ*: This family of degenerate, worm-like snakes, is composed of two genera; *Anomalepis*—1 Mexican species, and *Glauconia*—about 30 species, which inhabit semi-tropical America, Africa and southwestern Asia. The species are small; the head is usually very blunt and of the same width as the neck; the snout protruding some distance over the mouth. Abruptly tapering—in fact, conical—the tail forms barely more than one-twentieth the total length. There are no broad, abdominal plates, the body being encircled with smooth, glassy, imbricate (overlapping) scales. On the head the scalation is altogether different from that of most North American snakes (the *Colubridæ*); there are a few large plates, all crowded forward toward the snout. The eyes are buried under translucent shields and appear as mere black dots; they are practically useless except to distinguish between light and darkness.

These snakes are strictly subterraneous; they burrow long

The Blind Snakes and Dwarf Boas

tunnels and feed upon worms and insect larvæ. Some of the tropical species live in ant-hills.

Resume of the North American Species.

- a. A pair of *supraocular* plates. (See illustration).

Scales in fourteen rows.

Pale brown above; white beneath.

Dimensions.—Total Length 8-12 inches.

Tail about one-twentieth of the total length.

TEXAS BLIND SNAKE, *Glauconia dulcis*, B. & G.

Distribution.—Texas, New Mexico and Mexico.

- b. No *supraocular* plates. (See illustration).

Colouration like preceding.

CALIFORNIA BLIND SNAKE, *Glauconia humilis*, B. & G.

Distribution.—Arizona, southern California, Lower California and Mexico.

The Boas—Family *Boidæ*: The *Boidæ* is divided into two sub-families—the *Boinæ* and the *Pythoninæ*: but one species of the latter is found in the New World (in Mexico).

The scalation of the body is usually fine; with some of the species quite granular. The large crawling plates of the abdomen are not nearly so broad as on the Colubrine snakes. Head covered with enlarged scales, or with shields; pupil of eye usually elliptical. Most of the species show external traces of the rudimentary hind limbs in the shape of claw-like spurs.

Four species are found in North America; all are small. Two exhibit burrowing habits, like the Old World sand boas (*Eryx*) to which they are closely allied.

Key to the Species

General.—Scalation of the body very fine; abdominal plates narrow; *plates under the tail undivided*. Pupil elliptical. Body stout; tail blunt.

- a. *Head covered with scales*.

Genus *Lichanura*.

Bluish gray or brown, sometimes with three obscure, darker bands. Abdomen reddish.

ROSY BOA, *L. roseofusca*.

Distribution.—Southern California and Arizona.

Pale yellow, with three, very distinct, dark brown bands.

THREE-LINED BOA, *L. trivirgata*.

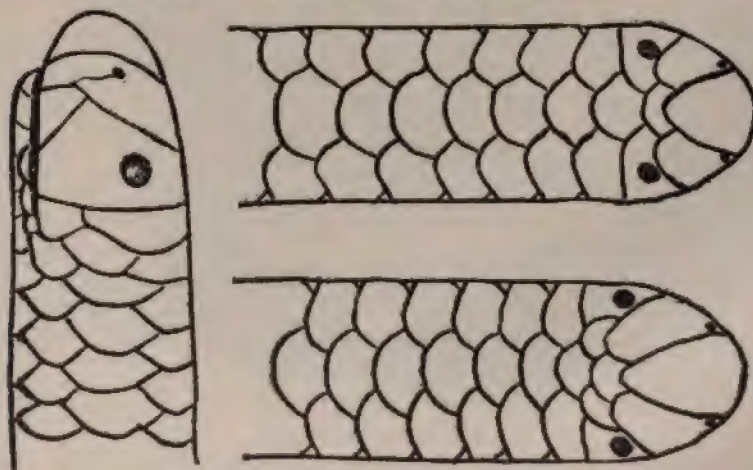
Distribution.—Lower California.

- b. *Head covered with shields*.

Genus *Charina*.

BLIND SNAKE, *Glauconia*

A mature example. Two species are found in the Southwest. Many inhabit tropical America and tropical portions of the old world. They live in ant-hills and look like polished worms.



Greatly enlarged heads of Blind Snakes—*Glauconia dulcis* and *G. humilis*. The latter from both top and side. The difference between the two species will be seen in the possession of a pair of plates between the eyes (the supraocular plates) with *G. dulcis*, and the absence of these with *G. humilis*.



HEAD OF THREE-LINED BOA,
Lichanura trivirgata



HEAD AND UNDER PART OF TAIL OF THE RUBBER BOA,
Charina botta



RUBBER BOA, *Charina botta*

A true boa of diminutive size that ranges farther from the Equator than any other species of the *Boida*. Found in the Pacific Region, from Oregon to Lower California

The Blind Snakes and Dwarf Boas

Yellowish brown or gray above; abdomen yellow.

RUBBER BOA, *C. bottae*.

Distribution.—Oregon to Lower California; eastward to Nevada.

Detailed descriptions:

THE ROSY BOA

Lichanura roseojusca, (Cope)

Body stout, tail short, blunt and slightly prehensile. Head rather long and but slightly distinct from the neck. Eye large, with elliptical (cat-like) pupil and surrounded with a ring of 7 to 10 scales. Several pairs of shields near the snout; remainder of head covered with scales. Scales of the body in 39 to 45 rows.

Colouration.—Bluish gray or brownish above, sometimes with traces of three brownish stripes. Abdomen red or yellowish, mottled with brown.

Dimensions.—Attains a length of about a yard, of which the tail occupies about four inches.

Distribution.—Southern California and Arizona.

Habits.—Apparently nothing is known of the habits of this rare snake.

THE THREE-LINED BOA

Lichanura trilineata, (Cope)

Eye larger than that of the preceding.

Colouration.—Pale yellow or brownish, with three vividly defined dark brown stripes or bands, extending from the snout to the end of the tail; the central of these bands is four scales wide and those on each side of it are five scales wide; the bands are separated by spaces three and a half scales in width.

Distribution.—The original specimens were found in swamps among the mountains near Cape St. Lucas, Lower California.

THE RUBBER BOA—SILVER SNAKE—TWO-HEADED SNAKE—WORM SNAKE

Barina bottae, (Blainville)

Size moderate. Form very stout. The tail is almost as blunt as the head, hence one of the popular names—two-headed

*A single specimen of this species, known as *C. trophopis*, it differs from the others in having a very long, thin, prehensile tail in contact with the ground, and in the absence of the posterior part of the orbit.

The Blind Snakes and Dwarf Boas

snake. Scales of the body very small; smooth and shining. Forward portion of head with fair-sized shields.

Colouration.—Brown, gray or olive; abdomen yellow and immaculate. There is no pattern.

Dimensions.—Total Length. $15\frac{1}{2}$ inches.
Length of Tail. $2\frac{1}{4}$ "
Greatest Diameter. $\frac{1}{2}$ "
Width of Head. $\frac{3}{8}$ "
Length of Head. $1\frac{1}{8}$ "

Distribution.—The Pacific region generally, from Washington (inclusive) to Lower California; eastward to central Nevada. This species ranges farther from the equator than any other of the *Boidæ*.

Habits.—Several examples of this stubby little boa have been under the writer's observation. They are very shy and if their cage is provided with a layer of moss or sand, will at once work their way into it, indicating subterranean habits, when in a wild state. Their actions are much like those displayed by the Old World sand boas (*Eryx*). They have a mild disposition and can be handled without showing any signs of hostility. Occasional specimens will contract the body into a series of veritable knots and twists, and assume so spherical an outline that they may be rolled about like a ball.

As captives, these snakes are fairly hardy and will eat young mice and very small birds, constricting the prey in the same fashion as the giant members of the *Boidæ*.

CHAPTER XXVI: THE STRIPED SNAKES—GARTER SNAKES

GENUS EUTÆNIA

A Genus of North American Snakes that are Noted for their Abundance and the Great Variation of Pattern Among Some of the Species—Key to the Identification of Species—Detailed Descriptions—Keys to the Identification of Varieties — Habits

THE species of this genus are characteristic from their pattern—usually three narrow yellow stripes upon a darker ground-colour. One of the stripes is upon the back; the others are on the lower portions of the sides.

The Striped Snakes are the most abundant of North American serpents. They frequent every portion of the continent in which snakes are found and extend as far southward as Central America. From a structural standpoint, they are closely related to the water snakes (*Tropidonotus*)—a relationship also demonstrated by the semi-aquatic habits of some of the species. All of the species produce living young and generally to a large number, which condition explains the general abundance of these reptiles.

As the Striped Snakes feed entirely upon cold-blooded prey—frogs, toads, fishes and worms, they cannot be classed as useful to the agriculturist. However, all of the species are quite harmless and inoffensive.

It is with real misgiving that the writer begins this chapter, for no genus of North American serpents is so difficult to describe as the present one—and particularly, to treat in a popular manner. Among several of the species the variations in pattern are so elaborate, that to describe the different species on the basis of colouration alone would be to bring about a meaningless repetition of exhaustive details. The commoner species vary to a bewildering degree, and in such a fashion that the beginner might be led to mistake a pronounced variety of one species for the typical form of another.

As reptiles generally have suffered from the tendency to create

The Striped Snakes—Garter Snakes

names for "new species" upon variations of the parent form, and base "sub-species" innumerable upon slight differences of pattern the reader will at once appreciate what inspiration this genus would furnish to the enthusiastic technical worker, whose ambition it is to add to the mass of scientific nomenclature. And such has been the case. Concerning this genus a battle of nomenclature has raged. Even the well established generic name—*Eutania*, of Baird and Girard, that appeared in their excellent Catalogue of the North American Snakes, in 1853, has been declared to be inappropriate, and other generic names have been proposed, to be in turn combated. One distinguished American authority recognised nearly fifty species and sub-species of the genus. His descriptions of them were bewildering. Some of the descriptions of varieties (sub-species) were based upon *single specimens*. Among serpents that vary almost individually, the value of such descriptions is open to some speculation.

Foreign authorities have treated this genus from an exactly reverse attitude. Species have been run together in such strenuous fashion that but few remain to represent the genus. Thus, if the student is to examine the few technical works on reptiles, he will be confronted by these extremes, and with a very misleading result.

With this explanation the reader will appreciate the author's misgivings in preparing the present chapter. To popularise the treatment of a genus of snakes evincing extreme variability, so as to make identification simple to the beginner and valuable to the advanced student as well, is a difficult proposition. However, the task has been attempted and the student is thus advised to go about the identification of specimens:

1. Pay especial attention to *form—whether stout, or very elongate, the outline of the head, and proportionate length of the tail.*
2. *Ascertain on what rows of scales the stripe of the side is situated.*
3. *Note the character of the spots (if any) between the stripes.*
4. *Take care to consider the locality in which the specimen was captured.*

With these suggestions in mind, the student should study the key that is given herewith. From this he will gain a bird's-eye view of the genus and the distribution of the species.

It must be understood that the patterns cited in the key

convey illustrations of the general run of colouration of the typical representatives of the different species and that many wide diversities of both colour and pattern occur among these snakes. Consequently the key can be nothing but a general outline of the genus *Eutania*. Those species marked with a * exhibit phases of variation that may be very confusing to the beginner. Such variations are treated in separate keys under the heads of the respective reptiles to which they appeal, in the detailed descriptions following the key.

Only those species occurring in the United States and northern Mexico have been considered. Several species inhabit Mexico and Central America, but it is necessary that our museums should possess larger series than those now existing, before a fair estimate of the standing of these extreme southern snakes, may be given.

The key follows:*

Division A. *General Pattern*.—Three Yellowish Stripes on a Darker Ground-colour.

- | | |
|---|--|
| <p>GROUP I.</p> <p>Side stripes on the third and fourth rows of scales.</p> | <p>a. <i>Very slender. Tail a third or more of the total length.</i>
Brown or black; three, vivid yellow stripes.
<i>RIBBON SNAKE, E. saurita.</i>
<i>Distribution</i>.—United States east of the Mississippi.
Olive, brown or black; yellow stripes on the sides but none on the back except for a short distance behind the head.
<i>SOUTHERN RIBBON SNAKE, E. sackeni.</i>
<i>Distribution</i>.—South Carolina, Georgia and Florida.</p> <p>b. <i>Moderately slender. Tail less than a third the total length.</i>
Brown or black; three yellow stripes—those on sides paler than the one on back.
<i>WESTERN RIBBON SNAKE, E. proxima.*</i>
<i>Distribution</i>.—United States west of the Mississippi, except in Indiana and Illinois; southward to Mexico.</p> <p>c. <i>Moderately stout. Tail about a quarter the total length.</i>
Ashy-brown; three, narrow yellow stripes.
<i>ARIZONA GARTER SNAKE, E. megalops.</i>
<i>Distribution</i>.—New Mexico, Arizona and Mexico.</p> <p>d. <i>Body stout. Tail about a quarter the total length.</i>
Brown or black; three, rather broad yellow stripes.
<i>PLAINS GARTER SNAKE, E. radix.</i>
<i>Distribution</i>.—Indiana to the Rockies; Canada to Texas. A very common species.</p> |
|---|--|

* From Arthur Erwin Brown, Superintendent of the Zoölogical Gardens, in Philadelphia, who is one of the foremost authorities on the variations of North American snakes, the writer has received many valuable suggestions regarding this genus.

The Striped Snakes—Garter Snakes

- GROUP II. {
Side stripes on the second, third and fourth rows of scales. {
- e. *Body stout; neck slender; head very small.*
 Black or brown; three broad, yellow stripes.
 BUTLER'S GARTER SNAKE, *E. butleri*.
Distribution.—Ohio and Indiana.
 - f. *Body stout; head moderately distinct.*
 Eight plates on upper lips; three yellow stripes on a darker ground-colour.
 WESTERN GARTER SNAKE, *E. elegans*.
Distribution.—Central Plains to the Pacific Coast.
- GROUP III. {
Side stripes on the second and third rows of scales. {
- g. *Moderately stout. Head very broad.*
 Eight plates on upper lips; brown, with three narrow, paler stripes; two large spots back of the head.
 BROWN GARTER SNAKE, *E. eques*.
Distribution.—Western Texas to Arizona; Mexico.
 - h. *Body stout; head moderately distinct.*
 Seven plates on upper lips; three yellow stripes on a darker ground-colour.
 COMMON GARTER SNAKE, *E. sirtalis*.
Distribution.—The entire United States and Mexico.
- Division B. *General Pattern.*—Dark spots on a paler ground-colour. *No stripes.*
- i. *Moderately stout.*
 Gray or brown; Seven rows of brown or reddish spots.
 SPOTTED GARTER SNAKE, *E. multimaculata*.
Distribution.—Southern New Mexico and northern Mexico.
 Pale brown; six rows of small, reddish spots on the forward portion of the body.
 RED-SPOTTED GARTER SNAKE, *E. rufopunctata*.
Distribution.—But one specimen known—from Arizona.
- *Subject to considerable variation of colour.

THE RIBBON SNAKE

Eutania saurita, (Linn.)

The species is one of the most slender of the American serpents. It is of moderate size. The scales are strongly keeled, thus imparting a velvety aspect to the upper surface. With most specimens, the tail constitutes a third or more of the total length.

Colouration.—Rich, dark brown or black above, with a vivid yellow stripe extending down the back, and a similar stripe on each side, *the latter covering the third and fourth rows of scales above the abdominal plates.* With brown specimens, the stripes are narrowly bordered with black. The stripe on the back is very sharply delineated and produces a ribbon-like aspect—hence the popular name.

The Striped Snakes—Garter Snakes

Beneath the stripe on the side, is a broad band of chestnut-brown, which covers the first and second rows of scales and extends a slight distance over the edges of the abdominal plates. The abdomen is immaculate yellowish-white.

The top of the head is dark, but the upper lip plates are bright yellow. In front of the eye, which is large, is an upright and narrow yellow streak or spot.

Like all of the serpents of the genus *Eutania*, the Ribbon Snake shows white, line-like spots on the skin between the scales when the body is distended. However, it lacks a character that is evident on the majority of these reptiles. This consists of a series of square spots between the stripes, arranged in checker-board fashion.

With the exception of one species, the Ribbon Snake is quite distinct from the other striped snakes, owing to its very elongate form. The species with which it may be confused is Osten-Sacken's Ribbon Snake (*E. sackeni*), another very slender reptile with bright yellow stripes on the sides, but either lacking the stripe of the back, or possessing only a dull streak of yellow immediately behind the head.

Dimensions.—The largest specimen of this species examined by the writer was taken near Fort Lee, New Jersey. It measured 32 inches in length; of these dimensions, the tail composed 10½ inches. Following are the measurements of an adult of average size:

Total Length.....	2 feet, 2 inches.
Length of Tail.....	9½ "
Diameter of Body.....	¾ "
Width of Head.....	¾ "
Length of Head.....	¾ "

Distribution.—Southeastern Canada and the United States, east of the Mississippi. It is not a very abundant species, and, unlike several of the reptiles of this genus, appears to retreat from the steadily increasing zones of cultivation. The writer has always found it in greatest numbers along the borders of streams and lakes, in mountainous regions.

Habits.—Frequenting damp places, generally the grassy banks of ponds and streams, this very active snake feeds upon small frogs, tadpoles and salamanders. It swims and dives with the ease and agility of the water snakes, and will take

The Striped Snakes—Garter Snakes

refuge beneath aquatic plants, remaining under the surface for some minutes.

On several occasions the writer has observed these snakes feeding while in a wild state. In one instance he was resting while crossing a belt of heavy timber, in New Jersey. The high, rasping croak of a wood frog denoted something to be the matter. Peering through the undergrowth a wood frog was seen struggling in the jaws of a Ribbon Snake. So vigorous was the batrachian that it tore itself from the reptile's grasp and started away in a series of frantic hops, with the snake in pursuit. So lightning-like were the undulations and progress of the pursuer that it readily kept up with the frog, although the former had a start of several feet gained immediately after its escape from the snake's jaws. After a dozen frenzied leaps, the frog paused to recover breath, and the snake, momentarily losing sight of it, stopped as well, but was all attention with head and neck up-raised, eyes staring in the direction of the prey, and flashing tongue. Imagining the danger past the frog settled down to rest. But woe to the unfortunate creature, a single move brought instantaneous fate. With the characteristic movement of frogs and toads it folded its limbs tighter to its body and flattened to the damp ground—but that slight movement betrayed its presence to the snake, which responded with a dash so quick and unerring that before the frog could make a jump it was in the reptile's jaws. The observer remained quiet until the frog was swallowed and the snake, with the outline of the meal clearly defined, glided away among the bushes.

Although snakes seem to be provided with sharp sight for small *moving* objects within a reasonable distance, that is, within four or five times of their own length, they appear to be unable to detect their prey if it remains motionless unless they cross a fresh trail and follow the scent. This interest in moving objects seemingly prompts captive Ribbon Snakes and other frog-eating species to display what may appear to be remarkable intelligence for a serpent. When many of these reptiles are kept in the same case and food is introduced, the snakes first seizing the small frogs or fishes as the case may be, at once begin to thrash their tails in a most vigorous fashion, seemingly to attract the attention of their associates that are voraciously searching for the food, having scented the same, to the commotion of the caudal appen-

The Striped Snakes—Garter Snakes

dage and away from what the reptile thus performing, is swallowing. There is, of course, a possibility that the snakes thus manœuvring are merely displaying nervous symptoms in the anticipation that their feeding will meet interference, but so invariable are these antics that the first theory appears more logical.

The number of young produced by this viviparous species is much smaller than with the majority of species of this genus. The average brood numbers about a dozen.

Unlike most of the striped snakes, which are voraciously fond of earthworms, repeated observations of the Ribbon Snake demonstrate that the species does not feed upon them.

THE SOUTHERN RIBBON SNAKE OR OSTEN-SACKEN'S RIBBON SNAKE

Eutænia sackeni, (Kennicott)

Size and form like the preceding species, but the colouration is distinctly different.

Colouration.—Dark brown, green or olive above, with a bright yellow stripe on each side, on the third and fourth rows of scales. With some specimens there is an indistinct stripe on the back, showing more brightly for an inch or so behind the head. With the majority, however, the stripe of the back is absent with the exception of a yellow streak on the neck.

The abdomen is yellowish-white, and immaculate, the edges of the plates tinged with brown as with the ribbon snake. When distended, the skin of the body shows elongated, white spots. There are no square, black blotches between the stripes—the same possessed by many of the garter snakes.

Dimensions.—This serpent appears to be a somewhat smaller species than the closely allied ribbon snake. The measurements given are of an adult:

Total Length	17 $\frac{3}{4}$	inches.
Length of Tail	6 $\frac{1}{8}$	"
Greatest Diameter	$\frac{1}{4}$	"
Width of Head	$\frac{1}{4}$	"
Length of Head	$\frac{1}{2}$	"

Distribution.—The coast regions of South Carolina and Georgia; Florida generally.

Habits.—In habits this species is very similar to the Ribbon

The Striped Snakes—Garter Snakes

Snake. It is very aquatic, and is seen frequently sunning on the branches of bushes that overhang the water into which it drops when alarmed.

It produces small broods of living young.

THE WESTERN RIBBON SNAKE

Eutania proxima, (Say)

In general outlines this species resembles the common ribbon snake, but the body is distinctly stouter, the tail proportionately shorter and the head broader.

Colouration.—The body is marked with three vividly defined stripes, on a black or dark brown ground, *but the stripe on the back is quite different in shade from those on the sides*. With the greater number of specimens the stripe on the back is deep orange-yellow, while the side stripes are pale greenish-yellow. Beneath the stripe on the side is a band of black or dark brown—covering the 1st and 2d rows of scales—and causing this paler stripe to appear in bold contrast.

The abdomen is immaculate greenish-white.

Variations.—The ground colour varies as does the colour of the stripes. Specimens from the Mississippi Valley are usually jet-black, or very dark brown, with an orange stripe on the back and pale greenish stripes on the sides. Frequent specimens from Texas possess a bright red stripe on the back. The ground colour of Texas and Mexican specimens varies into rich shades of green. There are no tessellated markings between the stripes, as seen with several of the commoner species of this genus.

Dimensions.—The measurements given are of an adult female specimen, captured near Dallas City, Illinois.

Total Length	30½ inches.
Length of Tail	8½ "
Greatest Diameter	½ "
Width of Head	½ "
Length of Head	1½ "

Distribution.—The Central States (the Mississippi Valley) including Indiana and Illinois in the East and Wisconsin in the North, thence southward to Louisiana. Westward, throughout eastern Texas and eastern Mexico as far south as central Vera Cruz.

The Striped Snakes—Garter Snakes

Habits.—In habits this snake appeals to the two preceding species. It is very quick in its motions, and appears to be perfectly at home in the water, swimming with agility and extreme grace and diving to the bottom of a pond or stream and there secreting itself among aquatic plants.

Captive specimens are very hardy, and will live indefinitely upon a diet of small frogs or fishes. A number of specimens in the writer's collection were very fond of climbing into a small branch that had been placed in their cage. Here they would coil in a tight cluster, with heads protruding in every direction. Upon the introduction of food they would dart for the prey in frenzied fashion, the lucky individuals thrashing their tails violently as if to distract the attention of their hungry associates from the morsels in the jaws of the former. One of these snakes gave birth to fifteen young on the 24th of August.

THE ARIZONA GARTER SNAKE

Eutænia megalops, (Kennicott)

The Arizona Garter Snake stands as a connecting link between the three slender-bodied species already described and the much stouter species of *Eutænia*. In form, it is moderately stout, though less so than the succeeding species. The form appeals somewhat to the Western ribbon snake (*E. proxima*), but compared with that species the body is distinctly stouter, the head much broader and the eyes larger, while the tail is proportionately shorter—about one quarter of the total length. Besides these structural differences, the pattern differs from that of the Western ribbon snake, the stripes of the sides being very narrow—and all of the stripes are of a *uniform* greenish-yellow or whitish.

Colouration.—Ashen brown, or clay colour, with narrow black lines, or spots on the edges of many of the scales; these spots, however, do not produce the tessellated (checker-board) pattern between the stripes as with most of the succeeding species. The stripe on the back is yellowish or greenish-white, and not so sharply delineated as with the species of the "ribbon snake" group. The stripes on the sides cover portions of the third and fourth rows of scales; they are narrow and of the same colour as the stripe on the back. Above, the head is paler than the

The Striped Snakes—Garter Snakes

body and the upper lip plates (superior labials) are greenish, margined with black.

The abdomen is greenish-yellow, the edges of the plates narrowly spotted with black.

Dimensions.—The measurements are of a specimen captured on Duck Creek, a tributary of the Gila River, by the late Prof. E. D. Cope:

Total Length.....	24	inches.
Length of Tail.....	6 $\frac{1}{4}$	"
Greatest Diameter.....	$\frac{1}{2}$	"
Width of Head.....	$\frac{1}{2}$	"
Length of Head.....	$\frac{7}{8}$	"

Distributions.—Arizona, New Mexico and the states of Sonora and Chihuahua, Mexico. In Mexico the species is very abundant.*

Habits.—Like many of the Western garter snakes, this species seems to be semi-aquatic in habits, generally frequenting the borders of streams and taking to the water when alarmed.

THE PLAINS GARTER SNAKE

Eutania radix, (Baird & Girard)

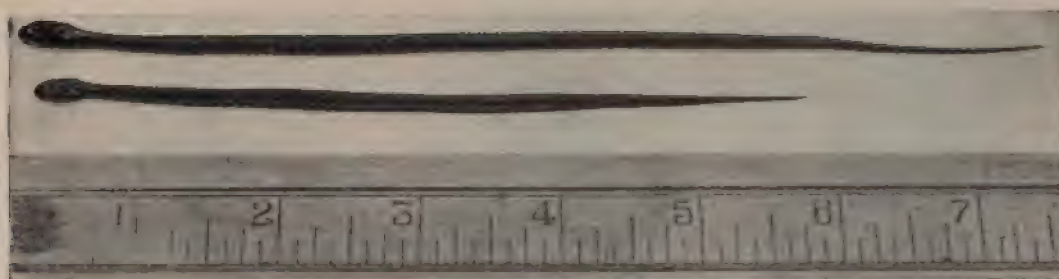
This very abundant snake of the plains region is stout in form, with broad and distinct head.

Colouration.—Dark brown, olive or black above, with three very distinct, yellow stripes—those of the sides on the third and fourth rows of scales. The stripe on the back is rich yellow; the side stripes are usually of a considerably paler hue. Except with very dark specimens, there are two distinct rows of square black spots between the stripes.

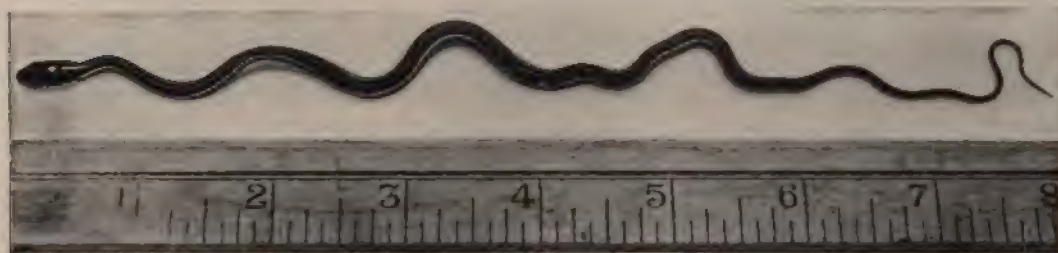
The abdomen is greenish, with black spots on the edges of the plates. The upper lip plates are yellow, heavily margined with black.

Although this species resembles the common garter snake (*E. sirtalis*) in stoutness of body, it may be at once recognised from the latter species by the presence of the lateral (side) stripe on the third and fourth rows of scales—this stripe with *sirtalis* being on the second and third rows of scales.

* A closely allied species, *Eutania macrostemma*, Kenn., inhabits Mexico generally, but does not seem to occur in the United States.



COMMON GARTER SNAKE, *Eutania sirtalis*
BUTLER'S GARTER SNAKE, *Eutania butleri*



WESTERN RIBBON SNAKE, *Eutania proxima*



WATER MOCCASIN, *Ameiostrodon piscivorus*. (Venomous.)

BREEDING HABITS OF SNAKES. NEWLY BORN EXAMPLES OF VIVIPAROUS SNAKES



1



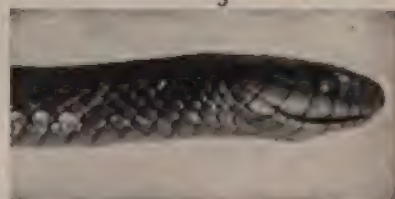
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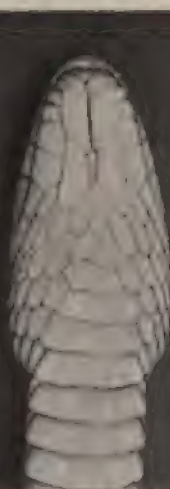
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11



12

1, 4, 10 *Eutania stictalis*. New York.
5, 9, 11 *Eutania elegans*. California.

2, 7 *Eutania elegans mexicana*. Texas.
8 *Eutania eques*. Arizona.

12 *Eutania butleri*. Ohio.
6, 9 *Eutania saurita*. New York.

The Striped Snakes—Garter Snakes

<i>Dimensions.</i> —Total Length	32 inches
Length of Tail	6 $\frac{1}{2}$ "
Greatest Diameter	$\frac{3}{4}$ "
Width of Head	$\frac{3}{4}$ "
Length of Head	1 $\frac{1}{8}$ "

Distribution.—The common striped snake of the Central States, where it occurs over an extended area. It is found from western Ohio to the eastern slopes of the Rocky Mountains. Northward the range is into southern Canada and southward into northern Texas.

Habits.—Although many specimens of this snake are found in dry areas, others frequent the neighborhood of streams and pools, where their habits are much like those of the water snakes. When alarmed they take to the water, and diving to the bottom wriggle among aquatic plants where they remain for some time. These specimens feed largely upon fishes. It is hardy as a captive, feeding voraciously upon frogs, toads and fishes. A large brood of living young is produced in August.

BUTLER'S GARTER SNAKE

Eutania butleri, (Cope)

Butler's Garter Snake is a peculiar and distinct species, both from its form and pattern. It is one of the smaller species.

The body is stout, but tapers to a long, thin neck and a very small head, which is of the same width as the neck. This small head is a strong characteristic and quite distinctly separates this species from any other snake of the genus. The tail is very short. The outlines of this snake are much like those of the pigmy water snake—*Tropidoclonium lineatum*.

Colouration.—The yellow stripes are vividly delineated and ribbon-like. The character of the stripe upon the side tends to place this species midway between those possessing the lateral (side) stripe on the third and fourth rows of scales and the succeeding members of the genus—with the lateral stripe on the second and third rows of scales.

The ground colour is uniform, rich dark brown or black, with a vivid yellow stripe on the back and a stripe of similar colour on the side, *covering the upper half of the second, the entire third and the lower half of the fourth rows of scales*. Beneath this stripe is a broad, dark band, as seen on the ribbon snake. The

The Striped Snakes—Garter Snakes

abdomen is greenish-white, with narrow black spots on the edges of some of the plates.

Dimensions.—The measurements comprise an average taken from a series of fifteen specimens. These were captured near Sandusky, Ohio.

Total Length.....	17 $\frac{3}{4}$ inches.
Length of Tail.....	4 "
Greatest Diameter.....	$\frac{1}{2}$ "
Width of Head.....	$\frac{5}{16}$ "
Length of Head.....	$\frac{3}{8}$ "

The very small head, as compared with the diameter of the thickest part of the body, may be noted from the preceding table of measurements.

Distribution.—Common in Ohio and Indiana. The species possibly occurs in adjacent states, though the writer's records are limited to the former.*

Habits.—The habits are quite similar to those of the larger (succeeding species). Captive individuals feed equally well upon small frogs, toads, fishes and earthworms. They will live for years in a plain box, with a glass front—the cage not longer than the reptiles' length and about a foot wide.

A captive female specimen gave birth to twelve young on the 4th of August. The mother was 19 $\frac{3}{4}$ inches long and the young showed an average length of 5 $\frac{1}{8}$ inches; in colouration they were much like young ribbon snakes as the ground-colour was brown and the vivid yellow stripes were black-bordered.

THE WESTERN GARTER SNAKE

Eutania elegans, (Baird & Girard)

The preceding species of *Eutania* described, although evincing some variation in the ground-colour, do not display any variation of *pattern*. In consequence, none of these is represented by varieties or sub-species. The present species—the Western Garter Snake—presents different conditions. It is an extremely variable species and represented by several very distinct varieties, which will be described under their respective names. Among these form, pattern and distribution show

* To Prof. E. L. Moseley, the writer is indebted for all of his specimens—about fifteen in number.



RIBBON SNAKE, *Eutania saurita*

Most slender of the striped snakes. Frequents the borders of ponds and streams in the Eastern States. Feeds upon frogs and fishes



SOUTHERN RIBBON SNAKE, *Eutania sacheni*

Told from the common ribbon snake by the absence of a stripe on the back



WESTERN RIBBON SNAKE, *Eutania proxima*

The central stripe is orange or red, the side stripes greenish yellow. By this character the species is quite distinct



PLAINS GARTER SNAKE, *Eutania radix*

Though thick-bodied it appeals to the ribbon snakes, as the stripes on the sides are on the 3d and 4th rows of scales. A Plains species



BUTLER'S GARTER SNAKE, *Eutania butleri*

Owing to its extremely small head the species is unique among the striped snakes. The stripes on the sides usually cover portions of the 2d, 3d and 4th rows of scales

The Striped Snakes—Garter Snakes

interesting differences. To render these comprehensive, a simple key is given:

General.—21 rows of scales—counted in an oblique line around the body (occasionally 19). Body rather stout and with three stripes (except in one variety)—the side stripe *on the second and third rows of scales*.

General Habitat.—The central plains to the Pacific Coast.

1. No markings on head.

Blackish or olive; stripe on side not very distinct. None or but faint spots between the stripes.

PACIFIC GARTER SNAKE, *E. elegans*—typical.

Distribution.—California to Oregon.

Blackish or olive; an orange stripe on the back; *no stripes on the sides*. Abdomen greenish, throat yellow.

SINGLE-STRIPED GARTER SNAKE, *E. elegans infernalis*.

Distribution.—Pacific region.

Greenish or ashy; a pale yellow stripe on back and sides (latter faint). Rows of small, round spots between stripes, some of the spots breaking central stripe.

One plate in front of eye (*preocular*).

GREEN GARTER SNAKE, *E. elegans vagrans*.

Distribution.—Central plains to Pacific Coast—Oregon to California.

Two plates in front of eye (preoculars.)

Markings like preceding.

WASHINGTON GARTER SNAKE, *E. elegans biscutata*.

Distribution.—Washington and Oregon.

2. A pale crescent on each temple.

Straw-colour, with narrow stripes and rows of large, square black spots.

MARCY'S GARTER SNAKE, *E. elegans marciana*.

Distribution.—Central Texas through Arizona.

Dark brown or olive, stripes narrow and spots indistinct.

COUCH'S GARTER SNAKE, *E. elegans couchi*.

Distribution.—Arizona and California.

The Typical Form.—The typical form of this species appeals much to several varieties of the more widely distributed *E. sirtalis*. It is a smaller reptile however, and evinces a difference of the chin shields*—as do all the varieties of the species, which character may be generally employed in distinguishing the forms of this species from those of the allied reptile—*sirtalis*.

* This useful point for identification was called to the writer's attention by Mr. Arthur Erwin Brown.

The Striped Snakes—Garter Snakes

Illustration—chins. Examination will show the larger chin shields of *E. elegans* to be fairly uniform in size, while the rear pair of these with *E. sirtalis* are considerably the longer. Besides these characters, the scales of the body, of the present species, are generally arranged in 21 oblique rows and there are usually eight upper lip plates. The allied species generally possesses 19 rows of scales and seven upper labial plates. However, both species exhibit variations into one or the other combinations—a condition which may demonstrate, with further investigation that the two are not thoroughly distinct species.

Colouration.—The pattern of the Pacific Garter Snake is not unlike that of some of the Eastern forms of *sirtalis*. The ground-colour is blackish, olive or dark brown. There is a bright stripe (generally yellow) of moderate width upon the back and a less sharply defined stripe on the side. Few specimens possess any but a slight trace of spots between the stripes. The abdomen is greenish yellow; the throat bright yellow. There are no dark borders on the upper lip plates.

Variation.—Even with the typical form there is a considerable degree of variation in colour as well as in the definition of the stripe on the side. Some specimens have a red stripe on the back and yellow stripes on the sides. Others have a yellow, central stripe and bright red stripes on the sides. Many specimens have a pronounced, bright yellow central stripe, and dull greenish stripes on the sides.

A number of specimens received from California are brilliantly marked. They are black above, with a vivid yellow stripe on the back, and rich, brick red stripes on the sides. The abdomen is green, blotched and speckled with red to such an extent as to make the under side of the snake appear as if the reptile had crawled over a surface spotted with blood.

Dimensions.—Following are the measurements of an adult specimen:

Total Length	27 $\frac{3}{4}$	inches
Length of Tail	5 $\frac{5}{8}$	"
Greatest Diameter	$\frac{5}{8}$	"
Width of Head	$\frac{5}{8}$	"
Length of Head	1 $\frac{1}{8}$	"

Distribution.—The Pacific coast region—Oregon to California.

THE SINGLE-STRIPED GARTER SNAKE

Eutænia elegans variety *infernalis*, (Cope)

This is a fairly distinct, showy reptile, but very closely related to the typical form. In size it is exactly like the latter and the scalation is the same.

Colouration.—Olive or blackish, with a rich orange-yellow stripe on the back. *There are no traces of stripes on the sides.* The abdomen is olive, with a central row of yellow blotches, becoming narrower and disappearing toward the tail. The throat is bright yellow.

Young specimens of this variety show fairly distinct greenish stripes upon the sides, a character demonstrating the very close relationship to the typical form.

<i>Dimensions</i> .—Total Length	26	inches.
Length of Tail	6	"
Greatest Diameter	$\frac{3}{8}$	"
Width of Head	$\frac{3}{8}$	"
Length of Head	$1\frac{1}{8}$	"

Distribution.—California.

Habits.—Were it not for the remarkable actions exhibited by serpents of the colouration of this variety, the writer would be tempted to consider the present reptile as but a phase of the typical form. From the latter its habits are different and quite eccentric—at least as regards its activity and methods of locomotion. It progresses in a rapid series of close, S-shaped movements and generally in an oblique direction to that in which the head is pointing—an evolution performed, though at a greatly reduced speed, by the "side-winder" rattlesnake. While making off in this fashion, if the snake is closely pursued, it will actually leap forward, for a distance of nearly a foot, by suddenly straightening the body. The writer has repeatedly noted the habit of these snakes of leaping from their cage when it is opened, throwing the body forward in a straight position, then making off over the floor at such a gait that it required some agility to catch them. The oblique method of progression at such times is almost uncanny. Of a large number of specimens, comprising three separate shipments, all displayed the same agile movements. They fed voraciously upon small toads and occasionally upon frogs, but exhibited a decided liking for the former. A

The Striped Snakes—Garter Snakes

number of these specimens gave birth to young and, judging from the small number in each litter, this form does not produce large broods as compared with related forms and species of the genus. The largest brood produced numbered fifteen young. These were born on the 20th of August. Another specimen gave birth to 8 young on the twenty-third of the same month, and a third to 7 young, on the 5th of September.

THE GREEN GARTER SNAKE

Eutania elegans, variety *vagrans*, (Baird & Girard)

The present form is easily recognised. The eyes are small and the upper lips are swollen and covered with large shields—characters which impart a sinister aspect to the head. The body is rather stout.

Colouration.—Greenish gray or yellowish above; with a narrow, yellow stripe on the back and very indistinct stripes on the sides. Between the stripes are two rows of small, rounded black spots; on the forward part of the body, some of the spots of the two upper rows fuse together, thus breaking the central stripe. With some specimens the spots over the greater part of the body fuse into the formation of narrow, wavy cross-bands. The abdomen is gray, profusely dotted or marbled with black. There is usually a pair of dark blotches behind the temples.

Dimensions.—A specimen from Beaver County, Utah, shows the following dimensions:

Total Length.	28½	inches.
Length of Tail.	6½	"
Greatest Diameter.	¾	"
Width of Head.	¾	"
Length of Head	1 1/8	"

Distribution.—The variety *vagrans* is widely distributed and very abundant. It occurs from the Plains region to the Pacific coast—northward to Oregon and southward into southern California, Arizona and New Mexico.

Habits.—In habits this form appears to be quite as aquatic as the typical water snakes—as least as regards many specimens figuring in the records of the writer. Captive specimens will enter a tank in chase of minnows and display great agility in catching the darting fish. This reptile literally swarms over many portions of the West.



WESTERN GARTER SNAKE, *Eutania elegans*

Differs from its rival species—*E. sirtalis*—in the greater number of scale rows, the shorter chin shields, and an additional labial plate



ONE-STRIPED GARTER SNAKE, *Eutania elegans*; phase *infernalis*

The olive body and single, deep orange stripe are sufficient characters to assist in immediate identification
Restricted to the Pacific Region



GRAY GARTER SNAKE, *Eutania elegans vagrans*

One of the most common serpents of the Western Plains Region and the Northwest. The ground colour is gray or greenish



MARCY'S GARTER SNAKE, *Eutania elegans marciiana*

Of the various striped snakes this is the most attractively marked. The checker-board pattern is usually cream colour and jet black

THE WASHINGTON GARTER SNAKE

Eutænia elegans, variety *bisculata*, (Cope)

Some specimens of the *E. elegans* group—Western Garter Snake—from Washington and Oregon, that appeal strongly in pattern and colours to the variety *vagrans*, have been given a distinct varietal name owing to the existence of two or three plates in front of the eye (preoculars) in place of the single plate, found with other forms. Upon this character, has been founded the variety *bisculata* of Cope. The character is not a constant one. Occasional specimens have but a single plate on one side of the head and two plates on the other. Some have three on each side. The rounded character of the body spots and the blackish abdomen, associate this form with *vagrans*, with which its dimensions tally.

MARCY'S GARTER SNAKE

Eutænia elegans, variety *marciana*, (Baird & Girard)

Of the different varieties of the Western Garter Snake this form is the most strikingly marked. It attains a considerably larger size than the typical form and is proportionately stouter.

Colouration.—Straw colour above, with large, square, jet-black spots arranged in tessellated fashion; there is a narrow, pale yellow stripe on the back and an indistinct yellowish stripe on the side. The abdomen is pure white and immaculate

The upper part of the head is olive. *On each temple is a bright yellow crescent*, and behind this a blackish collar. The upper lip plates are yellow, those beneath the eye marked with broad, black bars.

Dimensions.—Following are the measurements of an adult, female specimen, taken near Pecos City, Texas:

Total Length	28½ inches.
Length of Tail	6½ "
Greatest Diameter	¾ "
Width of Head	¾ "
Length of Head	1⅕ "

Distribution.—Common from central Texas to western Arizona. Occurs as far north as southern Colorado.

Habits.—As a captive, this snake is very hardy, feeding voraciously upon frogs, toads, fishes and that great delicacy

The Striped Snakes—Garter Snakes

of most garter snakes—the earthworm. A brood of fourteen of these serpents born in captivity, was successfully reared. These specimens lived for more than eight years and attained a considerably larger size than the parent, which survived them all and remained vigorous for twelve years, in a plain box with a glass front, but two feet long and a foot wide.

Of the many species and varieties of the striped snakes, the writer has always felt a particular liking for this handsome form. The bold, "checker-board" pattern of the body, the yellow crescents on each side of the head, and the fiery red tongue with its black tips, are characters that render the reptile striking and attractive.

The variety *couchii*: Like the form or variety *biscutata*, in its close relationship to the variety *vagrans*, Couch's Garter Snake is very closely related to *marciana*, from which it differs in the absence of the square, black spots between the stripes. The ground colour is pale, or dark brown, or olive. The stripes resemble those of *marciana*, while the abdomen, with different individuals, varies from yellow to black. The relationship to *marciana* is seen in the markings of the head. The upper lip plates near the eye have wide, dark borders, while upon the temple will be seen the pale crescent of the allied form, though this is less pronounced. In dimensions, Couch's Garter Snake is rather smaller than *marciana*. It occurs in Arizona and California.

THE BROWN GARTER SNAKE

Eutania eques, (Reuss.)

This species is characterised by its wide head, which presents a swollen appearance behind the eyes. Also, by the very narrow central stripe, which for its greater length, is but the width of a single scale. The scales of the body are in 19 rows. The species is most nearly allied to the common garter snake, *E. sirtalis*.

Colouration.—The usual colour is reddish brown, with a distinct but very narrow stripe of cream yellow on the back, and a stripe of similar colour on the sides, covering portions of the *second and third* rows of scales. The central stripe begins in pointed fashion behind the head, whence it suddenly widens on the neck, covering three rows of scales; behind this widened

The Striped Snakes—Garter Snakes

area it abruptly contracts to the width of but a single row of scales, thence extends along the body.

On the forward portion of the body there are large, dark blotches between the stripes, which character gives way on the latter portion to small spots—these bordering the stripes. Beneath the stripe on the sides is a narrow area of pale brown, with a row of small black spots in contact with the stripe. Along the lower edges of the first row of scales is another line of spots. The abdomen is immaculate yellow, or greenish-white.

Immediately behind the head are two very large, dark blotches. They are technically termed the *nuchal spots* and their presence constitutes an important distinguishing feature. The upper lip plates are yellow—those beneath the eye heavily bordered with black.

<i>Dimensions.</i> —Total Length	24½	inches.
Length of Tail	6½	“
Diameter of Body	½	“
Width of Head*.	⅞	“
Length of Head.	1	“

Distribution.—Western Texas, New Mexico and Arizona; northern Mexico.

THE COMMON GARTER SNAKE

Eutaenia sirtalis, (Linn.)

Although the colours and pattern of this species exhibits a great amount of variation which must be classified under the head of several sub-species or varieties, the latter are not so strikingly different from the typical form as is the case with varieties of the Western garter snake, *E. elegans*. As has been mentioned in the description of the latter species, there is a confusing similarity between some of its forms and the present species. One of the principle differences to be observed, is the number of rows of scales on the body. With the Western snake the scales of the greater number of specimens are in 21 rows. The Common Garter Snake usually possesses 19 rows of scales. There is also a difference in the structure of the chin shields—figured among the illustrations.

* Note the width of the head, which is ⅓ of an inch greater than the diameter of the thickest part of the body.

The Striped Snakes—Garter Snakes

The distinct varieties of the Common Garter Snake may be summed up in the following key:

General.—19 rows of scales—counted in an oblique row around the body (one variety with 17 rows). Body rather stout and with three stripes (except in one variety with which the stripes are lacking)—*the side stripe on the second and third rows of scales*.

General Habitat.—The most extensive of any species of this genus—comprising southern Canada, the entire United States and Mexico.

- I. Three pale stripes on a darker ground. *Scales in 19 rows*. Three yellowish or greenish stripes; ground-colour brown, green, olive or black. Usually two rows of black spots between the stripes. *No red on sides*.

COMMON GARTER SNAKE, *E. sirtalis*, typical form, *Distribution*.—Southern Canada and the United States, east of the plains.

Three yellowish or greenish stripes; ground-colour brown, green or black. Upper row of spots between stripes fused into a band; lower row narrowly separated.

Skin on the side, bright, brick red.

RED-BARRED GARTER SNAKE, *E. sirtalis parietalis*.

Distribution.—The plains to Texas; westward to California and Washington. Occasionally, though very rarely, found in the Eastern States.

Three narrow broken greenish stripes on a jet black ground; abdomen dark green or slaty.

PICKERING'S GARTER SNAKE, *E. sirtalis pickeringii*.

Distribution.—Western Montana, Idaho, Oregon and Washington.

- II. Three pale stripes on a darker ground. *Scales in 17 rows*. Colours and pattern like the typical form. Differs in lesser number of scale rows, by the small, narrow head and generally smaller size of the adult.

NARROW-HEADED GARTER SNAKE, *E. sirtalis leptcephala*.

Distribution.—Pacific region—California to British Columbia.

- III. No stripes. Distinct rows of spots. *Scales in 19 rows*. Green, olive or brown, with rows of black spots, arranged in tessellated fashion.

SPOTTED GARTER SNAKE, *E. sirtalis ordinatus*.

Distribution.—States east of the Mississippi.

The Typical Form.—The Common Garter Snake, of the Eastern States, is, in itself, extremely variable in its pattern and colours. Mature specimens are quite stout. Young individuals

The Striped Snakes—Garter Snakes

are rather slender. A very large specimen will measure about a yard in length.

Colouration.—The ground-colour may be brown, olive, or black. On lighter specimens the rows of spots between the stripes are well defined. The central stripe usually covers the middle row of scales and half a row on each side. This stripe may be yellow, green or whitish, and in the case of the majority of specimens is more vividly defined than the stripe on the sides as it is bordered on each side with the dark ground-colour, while the lower stripe is bordered only above by this dark hue and beneath comes in contact with a pale, brownish tinge. The latter covers the first row of scales and edges of the abdominal plates, and offers a less contrasty border than the ground-colour. On some specimens the stripes of the sides fuse into this pale band, and are thus very obscure. Such specimens show but little trace of the central stripe.*

As is the case with most of the species of this genus, the Common Garter Snake shows white, line-like spots on the skin between the scales, when the body is distended. Although the usual rows of square black spots cannot be discerned on very dark (black) specimens, the borders of such spots are always indicated by the sprinkling of the white dots or lines on the skin, a condition very apparent on a specimen with body flattened from anger, or much distended with food.

The abdomen of the typical form is greenish-white or yellow, with two rows of small, black blotches on the edges of the plates. The blotches are situated on the front edge of each plate and are slightly covered by the overlapping portion of the preceding plate. The upper lip plates (superior labials) are coloured like the abdomen and in contrast to the remaining portion of the head, which assumes the hue of the body.

With a form so variable in colour and pattern, specimens may frequently be found that seem to fit nowhere and thus greatly confuse the student. To meet such emergencies, the writer has prepared the following concise descriptions, illustrating phases of variation that have come under his notice, and possibly furnishing helpful suggestions for the determination of odd specimens.

* Upon such specimens has been founded the varietal name *pallidula* (Allen).

The Striped Snakes—Garter Snakes

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COMMON GARTER SNAKE, *E. sirtalis*, typical form,
Distribution.—Southern Canada and the United States, east of the plains.

Three yellowish or greenish stripes; ground-colour brown, green or black. Upper row of spots between stripes fused into a band; lower row narrowly separated.

Skin on the side, bright, brick red.

RED-BARRED GARTER SNAKE, *E. sirtalis parietalis*.
Distribution.—The plains to Texas; westward to California and Washington. Occasionally, though very rarely, found in the Eastern States.

Three narrow broken greenish stripes on a jet black ground; abdomen dark green or slaty.

PICKERING'S GARTER SNAKE, *E. sirtalis pickeringii*.
Distribution.—Western Montana, Idaho, Oregon and Washington.

- II. Three pale stripes on a darker ground. *Scales in 17 rows*. Colours and pattern like the typical form. Differs in lesser number of scale rows, by the small, narrow head and generally smaller size of the adult.

NARROW-HEADED GARTER SNAKE, *E. sirtalis leptcephala*.
Distribution.—Pacific region—California to British Columbia.

- III. No stripes. Distinct rows of spots. *Scales in 19 rows*. Green, olive or brown, with rows of black spots, arranged in tessellated fashion.

SPOTTED GARTER SNAKE, *E. sirtalis ordinatus*.
Distribution.—States east of the Mississippi.

The Typical Form.—The Common Garter Snake, of the Eastern States, is, in itself, extremely variable in its pattern and colours. Mature specimens are quite stout. Young individuals

are rather slender. A very large specimen will measure about a yard in length.

Colouration.—The ground-colour may be brown, olive, or black. On lighter specimens the rows of spots between the stripes are well defined. The central stripe usually covers the middle row of scales and half a row on each side. This stripe may be yellow, green or whitish, and in the case of the majority of specimens is more vividly defined than the stripe on the sides as it is bordered on each side with the dark ground-colour, while the lower stripe is bordered only above by this dark hue and beneath comes in contact with a pale, brownish tinge. The latter covers the first row of scales and edges of the abdominal plates, and offers a less contrasty border than the ground-colour. On some specimens the stripes of the sides fuse into this pale band, and are thus very obscure. Such specimens show but little trace of the central stripe.*

As is the case with most of the species of this genus, the Common Garter Snake shows white, line-like spots on the skin between the scales, when the body is distended. Although the usual rows of square black spots cannot be discerned on very dark (black) specimens, the borders of such spots are always indicated by the sprinkling of the white dots or lines on the skin, a condition very apparent on a specimen with body flattened from anger, or much distended with food.

The abdomen of the typical form is greenish-white or yellow, with two rows of small, black blotches on the edges of the plates. The blotches are situated on the front edge of each plate and are slightly covered by the overlapping portion of the preceding plate. The upper lip plates (superior labials) are coloured like the abdomen and in contrast to the remaining portion of the head, which assumes the hue of the body.

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* Upon such specimens has been founded the varietal name *pallidula* (Allen).

The Striped Snakes—Garter Snakes

Stripes distinct.

Velvety black. A white stripe on back. Westchester
Stripes on sides, straw colour. Abdomen rich County,
yellow.* New York.

Velvety black. A bright green Swamp near Brooklyn,
stripe on back. Stripes on sides, straw New York.
colour. Abdomen pale green.

Rich brown. A white stripe on back. Sullivan County,
Dull yellow stripes on sides. Black spots New York.
between the stripes.

Brilliant brick red, with white stripes. Marion County,
Small black spots between the stripes.† Florida.

Olive, with narrow yellow stripes. The Pike County,
central stripe broken at regular intervals by Pennsylvania.
black spots.

Black, with broad stripes on back and Western Indiana.
sides, those on the sides broken at regular-
intervals by broad bars of black.‡

No stripes on sides.

Black with a dull yellow stripe on back. Adirondack Mts.,
A broad, dark brown band on side extending New York.
from the edges of the abdominal plates to
the third row of scales (inclusive).

Same as the preceding with the excep- Adirondack Mts.,
tion of band on side which is pale yellow. New York.

All the stripes absent.¶

Black above, with a broad band of dull Green County,
brown on the sides. New York.

Green above, with paler brown band Sullivan County,
on the sides.§ New York.
Also Indiana and
Illinois.

Dimensions.—The measurements given represent an adult
of average size:

* This phase was called *obscura*, by Prof. E. D. Cope, owing to the
absence of spots between the stripes.

† This remarkable specimen undoubtedly represented a phase of
albanism. Its tongue was red at the base, with white, forked tips.

‡ Has been named *E. sirtalis semifasciata*, Cope, but is not constant.
Females of this pattern give birth to young of the ordinary type among
others that are marked like the parent.

¶ These forms approach the variety *ordinatus*.

§ Called *Eutania virens graminea*, by Prof. Cope.

The Striped Snakes—Garter Snakes

Total Length.....	31 inches.
Length of Tail.....	5 "
Greatest Diameter.....	$\frac{5}{8}$ "
Width of Head.....	$\frac{5}{8}$ "
Length of Head.....	1 $\frac{1}{2}$ "

Distribution.—The typical form of the Common Garter Snake is abundant from southern Canada to Florida (inclusive) and westward to the Mississippi. It extends yet farther westward—to the Great Plains—but in this extreme western portion of its range is not abundant.

Habits of the Garter Snake

Occurring in nearly every part of North America, Mexico and Central America in which serpent life exists, the Garter Snake is probably the most generally distributed and abundant of all the harmless snakes, in the Western as well as the Eastern hemispheres. This hardy reptile, ranging well northward into Canada, is the last of the snakes to hibernate in the fall and the first to appear in the spring. It is not unusual to find these reptiles basking in the sun of early March, though the woods yet contain large patches of unmelted snow. Issuing from their hibernating places during the warmest part of the day, they seek shelter as soon as the sun's rays show signs of weakening. The favourite situations in which to pass the cold months, are in soft soil on a slope that faces the south. Here the reptiles burrow down a yard or more. Rocky situations are often selected and among the clefts and fissures, one opening into another, the snakes are enabled to retire to a considerable depth from the surface.

It is in the fall that these snakes congregate in large numbers, on ground that is suitable for the winter's sleep. Here they sun themselves during the middle of the day, retiring into clefts and burrows during the chilly autumn nights. As the nights become colder, their basking periods during the day are shortened and finally, after the first severe frost, they remain below the ground for the winter. Instinct seemingly attracts them to these places of hibernation, for such spots are usually poor feeding grounds and have been devoid of snakes during the summer months. In spring, the breeding time, the reptiles remain in numbers until the weather has become well settled and the

The Striped Snakes—Garter Snakes

The distinct varieties of the Common Garter Snake may be summed up in the following key:

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General Habitat.—The most extensive of any species of this genus—comprising southern Canada, the entire United States and Mexico.

- I. Three pale stripes on a darker ground. *Scales in 19 rows*. Three yellowish or greenish stripes; ground-colour brown, green, olive or black. Usually two rows of black spots between the stripes. *No red on sides*.

COMMON GARTER SNAKE, *E. sirtalis*, typical form.
Distribution.—Southern Canada and the United States, east of the plains.

Three yellowish or greenish stripes; ground-colour brown, green or black. Upper row of spots between stripes fused into a band; lower row narrowly separated.

Skin on the side, bright, brick red.

RED-BARRED GARTER SNAKE, *E. sirtalis parietalis*.

Distribution.—The plains to Texas; westward to California and Washington. Occasionally, though very rarely, found in the Eastern States.

Three narrow broken greenish stripes on a jet black ground; abdomen dark green or slaty.

PICKERING'S GARTER SNAKE, *E. sirtalis pickeringii*.

Distribution.—Western Montana, Idaho, Oregon and Washington.

- II. Three pale stripes on a darker ground. *Scales in 17 rows*. Colours and pattern like the typical form. Differs in lesser number of scale rows, by the small, narrow head and generally smaller size of the adult.

NARROW-HEADED GARTER SNAKE, *E. sirtalis leptcephala*.

Distribution.—Pacific region—California to British Columbia.

- III. No stripes. Distinct rows of spots. *Scales in 19 rows*. Green, olive or brown, with rows of black spots, arranged in tessellated fashion.

SPOTTED GARTER SNAKE, *E. sirtalis ordinatus*.

Distribution.—States east of the Mississippi.

The Typical Form.—The Common Garter Snake, of the Eastern States, is, in itself, extremely variable in its pattern and colours. Mature specimens are quite stout. Young individuals

The Striped Snakes—Garter Snakes

are rather slender. A very large specimen will measure about a yard in length.

Colouration.—The ground-colour may be brown, olive, or black. On lighter specimens the rows of spots between the stripes are well defined. The central stripe usually covers the middle row of scales and half a row on each side. This stripe may be yellow, green or whitish, and in the case of the majority of specimens is more vividly defined than the stripe on the sides as it is bordered on each side with the dark ground-colour, while the lower stripe is bordered only above by this dark hue and beneath comes in contact with a pale, brownish tinge. The latter covers the first row of scales and edges of the abdominal plates, and offers a less contrasty border than the ground-colour. On some specimens the stripes of the sides fuse into this pale band, and are thus very obscure. Such specimens show but little trace of the central stripe.*

As is the case with most of the species of this genus, the Common Garter Snake shows white, line-like spots on the skin between the scales, when the body is distended. Although the usual rows of square black spots cannot be discerned on very dark (black) specimens, the borders of such spots are always indicated by the sprinkling of the white dots or lines on the skin, a condition very apparent on a specimen with body flattened from anger, or much distended with food.

The abdomen of the typical form is greenish-white or yellow, with two rows of small, black blotches on the edges of the plates. The blotches are situated on the front edge of each plate and are slightly covered by the overlapping portion of the preceding plate. The upper lip plates (superior labials) are coloured like the abdomen and in contrast to the remaining portion of the head, which assumes the hue of the body.

With a form so variable in colour and pattern, specimens may frequently be found that seem to fit nowhere and thus greatly confuse the student. To meet such emergencies, the writer has prepared the following concise descriptions, illustrating phases of variation that have come under his notice, and possibly furnishing helpful suggestions for the determination of odd specimens.

* Upon such specimens has been founded the varietal name *pallidula* (Allen).



RED-BARRED GARTER SNAKE, *Eutamias sirtalis parietalis*
The pale bars on the sides are brick red. Found in the Central States



PICKERING'S GARTER SNAKE, *Eutamias sirtalis pickeringii*
This is the blackest of the varieties of *E. sirtalis*. The central stripe is broken into a series of dots. Occurs in the Pacific Region



SPOTTED GARTER SNAKE, *Eutamias sirtalis ordinata*
On this Eastern variety the stripes are entirely absent

The Striped Snakes—Garter Snakes

Aug.	9th.	Brood of 31.	Female from	Sullivan Co., N. Y.
	11th.	" " 27.	" "	Marion Co., Fla.
"	12th.	" " 51.	" "	Rockland Co., N. Y.
"	2nd.	" " 16.	" "	Sullivan Co., N. Y.
"	23rd.	" " 28.	" "	Westchester Co., N. Y.
"	31st.	" " 11.	" "	Bronx Park, N. Y.
Sept.	3rd.	" " 8.	" "	" " "
	5th.	" " 11.	" "	Sullivan Co., N. Y.

In one brood of thirty-four specimens, three were albinos, being perfectly white, with pink eyes, and another, of normal colouration, possessed two perfectly formed heads and necks on one body. The latter specimen died within a few hours. The albinos survived to grow to some size. They appeared translucent when held to the light.

THE SPOTTED GARTER SNAKE

Eutænia sirtalis, variety *ordinata*, (Linn.)

Size and form like the typical snake.

Colouration.—Green, olive or brown, with rows of square black spots, arranged in tessellated fashion. *There are no stripes.* With occasional very dark specimens, the spots are very obscure. There is usually a dull brown band, covering the first three rows of scales. The majority of specimens are distinctly greenish.

The writer has noted that many females of this variety give birth to litters in which are spotted individuals like the parent and others with three distinct stripes. Owing to these conditions the variety cannot be regarded as very distinct or constant.

Distribution.—Southeastern Canada and the United States generally, east of the Mississippi River. The greater number of specimens come from the New England States. This snake is not so abundant as the typical form, although it covers much the same area of distribution.

THE RED-BARRED GARTER SNAKE

Eutænia sirtalis, variety *parietalis*, (Say)

Colouration.—This variety is distinct, owing to the fusing together of the black spots on each side of the central stripe, and the fusing of the lower series of spots into the solid black area above, thus restricting the ground-colour to narrow bars

The Striped Snakes—Garter Snakes

between the latter series of spots; *these bars are usually bright brick red*.* The area covered by the spots is not black with all specimens of this form. Some show a rich brown tinge—others a dull olive. The central stripe is distinct, and may be yellow, greenish, or red. The side stripe on many specimens comes in contact with the red bars and imparts a wavy, chain-like outline, especially on the forward portion of the body. The top of the head is pale olive, or reddish-yellow.

Beneath, this form may be dull yellow, green or olive, with the chin much paler.

<i>Dimensions.</i> —Total Length	25 $\frac{1}{2}$	inches.
Length of Tail	6 $\frac{1}{2}$	"
Greatest Diameter	$\frac{5}{8}$	"
Width of Head	$\frac{9}{16}$	"
Length of Head	1 $\frac{1}{8}$	"

Distribution.—Occurs commonly throughout the plains region, from Montana to Texas and westward to California and Washington. It has also been taken in the Eastern States, but in the latter is very rare.

PICKERING'S GARTER SNAKE

Eutania sirtalis, variety *pickeringii*, (B. & G.)

Pickering's Garter Snake represents a phase of variation from the ancestral form in the direction of the variety *parietalis*, but carried to an extreme degree. The black, represented by square, tessellated markings on most of the forms, has suffused the entire upper surface, obliterating all traces of a ground-colour and restricting the stripe on the back to a very narrow, broken streak of greenish or yellow; the stripes of the sides are wider and of the same colour as the central stripe. Beneath them is a jet-black area, which fuses into the slate colour or dark olive of the abdomen. The chin is whitish.

The black of the upper surface is usually intense—although some specimens are very dark brown—and has a soft, velvety effect upon individuals that have freshly shed the epidermis.

*A colour that quickly fades to yellowish-white on alcoholic specimens.

The Striped Snakes—Garter Snakes

Dimensions.—Total Length 29½ inches.
 Length of Tail 7½ “
 Greatest Diameter ⅝ “
 Width of Head 1⅞ “
 Length of Head 1⅞ “

Distribution.—Western Montana, Idaho, Oregon and Washington.

THE NARROW-HEADED GARTER SNAKE

Eutænia sirtalis, variety *leptocephala*, (B. & G.)

In pattern and colours this variety appeals strongly to the typical form. Its structural characters are fairly distinctive and may be summarised as follows: The frequent possession of 17 oblique rows of scales in place of the usual 19 rows, of forms of this species; the small, narrow head, but little distinct from the neck; the smaller size of the reptile as compared with others of the *sirtalis* group.

Colouration.—Brown or olive, with three distinct, yellow stripes of much the same width and appearance as the typical form. Between the stripes are two rows of spots, differing in their character from the pattern of other forms, in not being in contact with each other. The abdomen is dark olive or blackish.

Dimensions.—The measurements of a mature female specimen are given:

Total Length 16½ inches.
 Length of Tail 3⅞ “
 Greatest Diameter ⅝ “
 Width of Head 1⅞ “
 Length of Head ⅝ “

Distribution.—The Pacific region, from central California northward to British Columbia.

THE WESTERN SPOTTED GARTER SNAKE

Eutænia multimaculata, (Cope)

This aquatic species occurs in the United States, only in southern New Mexico. It is common in the state of Chihuahua, Mexico. The body scales are in 21 oblique rows. The species attains a length of about twenty-nine inches.

Colouration.—Grayish or brown, *without stripes*, but marked with six or seven series of brown or reddish spots which are paler

The Striped Snakes—Garter Snakes

in their centres. The abdomen is cream colour, with black blotches on the edges of the plates.

Distribution.—Southern New Mexico; northern Mexico.

Habits.—This snake frequents the borders of streams and when alarmed plunges into the water, whence it dives to the bottom to conceal itself among aquatic vegetation.

THE RED-SPOTTED GARTER SNAKE

Eutania rufopunctata, (Cope)

But one specimen of this species seems to be known. It is closely related to the preceding reptile. The general colour is light brown. *There are no stripes*. The forward portion of the body is marked with six rows of small, reddish spots, which, on the central portion, become obscure; they are not distinguishable on the latter half.

The length of the type specimen is 10½ inches. It was captured in southern Arizona.

To the Student: In the work of identifying species and varieties of this interesting genus, the student may come in contact with many knotty problems—possibly become enthusiastic over the diversities of colour and pattern that are always to be found in a large series of specimens. It is then that the writer begs the student to pause and meditate. Do not theorise, and afterward inflict scientific annals with descriptions of “new species” and sub-species, but devote your energies along lines that will simplify classification. Certain it is, that there are among reptiles many alleged species which are doubtful. Is it not of greater value to science, to discover the points by which these may be stricken from our lists than to create others of equal uncertainty? Unfortunately, among scientists, name-making and theory has been the rule rather than practical work to afford lasting results. And to carry out the latter the student must regard a subject from a broad standpoint. Valuable time should not be wasted in hair-splitting discussions. Instead, however, large series should be examined with a view of establishing relationship in the comparison of one form with another. North American herpetology stands in need of such researches.



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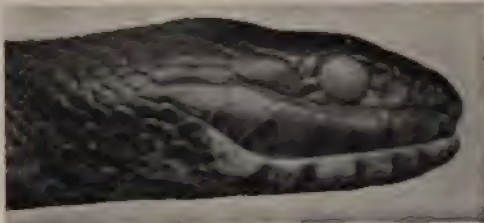
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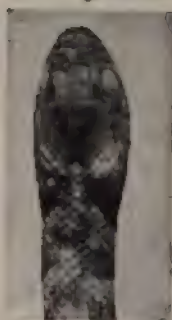
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HEADS OF THE WATER SNAKES

1, 7 *Tropidonotus leheris*. Ohio.2, 5 *Tropidonotus fasciatus*. Florida.8, 10 *Tropidonotus rhombifer*. Illinois.4, 6 *Tropidonotus grahami*. Missouri.3, 9 *Tropidonotus taxispilotus*. Georgia.11 *Tropidonotus validus*. Mexico.12, 13 *Seminatrix pygaea*. Florida.



QUEEN SNAKE, *Tropidonotus leberis*. Young
Young examples of this Eastern snake have vivid yellow bands on the sides which cause them to look like the striped snakes



QUEEN SNAKE, *Tropidonotus leberis*. Adult
With maturity the upper surface is dull, uniform brown. The bands on the sides are quite obscure



GRAHAM'S WATER SNAKE, *Tropidonotus grahami*
One of the longitudinally banded water snakes. The wide, pale band on the side is characteristic
Found in the Mississippi valley

CHAPTER XXVII: THE WATER SNAKES

GENUS TROPIDONOTUS

A Large Genus of Semi-aquatic Serpents that occur in both the Eastern and Western Hemispheres—Descriptions of the North American Species—Their Habits

SEVERAL dozen species comprise this genus. They are common reptiles in the United States, Europe and Asia and well merit the popular title—Water Snakes—owing to their semi-aquatic habits. Without exception these serpents frequent the borders of rivers and streams, ponds or lakes, or live in swampy places. When disturbed they generally take to the water for protection. Being agile swimmers, they are enabled to dive to the bottom for protection and remain there for some time, or to swim into thick, weedy places and there conceal themselves. The habits of the familiar Banded Water Snakes of the Eastern States, stand as typical illustrations of the life these creatures lead. They cannot be classed as economically valuable to man, as their food consists entirely of cold-blooded creatures—frogs, toads, fishes and the like. Although generally pugnacious and provided with teeth capable of inflicting slight lacerations, all of the species are entirely devoid of venom.

The snakes of this genus are viviparous—bringing forth living young and in large numbers.

Ten species, and several distinct varieties inhabit North America, eight of which occur east of the Mississippi River. These snakes may generally be recognised by their stout bodies and coarsely keeled scales.

A key to facilitate the identification of North American species, follows:

I. *Body striped lengthwise:*

Dark brown; three black stripes on back; a yellow stripe on each side; abdomen yellow, with three black stripes.

QUEEN SNAKE, *T. leberis*.

Habitat.—Eastern United States.

The Water Snakes

Brown above; a pale stripe on back and a broad yellow band on side, bordered with black stripes; abdomen yellow.

GRAHAM'S WATER SNAKE, *T. grahami*.

Habitat.—The Mississippi Valley.

Olive; two black stripes on back; abdomen yellow, with two rows of black spots.

STRIPED WATER SNAKE, *T. rigidus*.

Habitat.—Pennsylvania to the Gulf.

Light brown; four dark stripes on the back; abdomen yellow in the middle, olive on the sides.

CLARK'S WATER SNAKE, *T. clarki*.

Habitat.—Louisiana and Texas.

Grayish-brown, usually with lines of small black spots on the sides; abdomen uniform yellow.

WESTERN WATER SNAKE, *T. validus*.

Habitat.—Extreme southwest; Mexico.

II. *Body transversely banded:*

a. *Tail somewhat flattened.*

Olive; small cross-bands on the back; smaller blotches on sides.

FLAT-TAILED WATER SNAKE, *T. compressicaudus*.

Habitat.—Florida.

b. *Tail round.*

Wide, dark cross-bands for the greater length of body, with red or brown interspaces; abdomen white, with red and black spots.

BANDED WATER SNAKE, *T. fasciatus*.

Habitat.—Virg. to Fla.; westward to Texas.

Wide, dark cross-bands on forward portion of body, breaking into blotches on latter portion; abdomen white, with red and black spots.

COMMON WATER SNAKE, *T. fasciatus* variety *sipidon*.

Habitat.—Canada to North Carolina; westward to Kansas.

Wide, dark blotches on the back, separated by lighter inter-spaces of about one scale in width; similar, alternating blotches on the sides, with wide interspaces; abdomen yellowish.

GREEN-BANDED WATER SNAKE, *T. fasciatus* variety *transversus*.

Habitat.—Louisiana, Texas and Arkansas.

Rusty brown above; usually no bands, or these indistinct.

Abdomen immaculate vermillion.

RED-BELLIED WATER SNAKE, *T. fasciatus* variety *erythrogaster*.

Habitat.—Southeastern United States.

Brown, with narrow black cross-bands, forming a diamond-shaped pattern on back; abdomen yellowish.

DIAMOND-BACKED WATER SNAKE, *T. rhombifer*.

Habitat.—Mississippi Valley to Mexico.

Dark green; narrow black cross-bands on back, and similar bands, in alternation on sides; abdomen yellow.

GREEN WATER SNAKE, *T. cyclopius*.

Habitat.—Mississippi Valley and Gulf States.

(Most abundant in Florida).

Rusty brown; large square blotches of dark brown or black on the back, and similar, smaller blotches on sides. Abdomen yellowish, blotched with brown.

BROWN WATER SNAKE, *T. taxipilotus*.

Habitat.—Maryland to the Gulf States.

Detailed descriptions of these species are given herewith:

THE QUEEN SNAKE

Tropidonotus leberis, (Linn.)

Moderate in size, this species is considerably more slender than the majority of the water snakes. Its scales are roughly keeled.

Colouration.—Dark brown above, with three narrow, black stripes on the back (which are often indistinct) and a bright yellow stripe on the lower portion of the side, covering one-half of the first and second rows of scales.

The abdomen is yellow, with two dark brown stripes in the centre. If the narrow area of ground-colour beneath the yellow stripe on the side may be termed a band, this species might be said to have four dark bands beneath.

The upper lip plates (*labials*) and the nose plate (*rostral*) are yellow.

Dimensions.—The measurements of an adult specimen are given:

Total Length	2 feet.
Length of Tail	4 $\frac{3}{4}$ inches.
Greatest Diameter	$\frac{8}{16}$ "
Width of Head	$\frac{7}{16}$ "
Length of Head	$\frac{1}{2}$ "

Distribution.—The United States generally, east of the Mississippi River, but not common in the extreme Northern or Southern States. It is abundant in Ohio and the eastern portion of Illinois.

Habits.—Having no opportunity of observing many of these snakes in captivity, the writer is indebted to Mr. C. S. Brimley, of Raleigh, North Carolina, for the following notes upon the habits:

"So far as I know, *Natrix leberis* is aquatic and hangs on the bushes above the small brooks. Curiously enough it is only found on tributaries of Crabtree Creek, on the north side of Raleigh and not on the tributaries of Walnut Creek south of town. I am not sure whether I have ever had one to take food in captivity, but rather think I have. If one did, the food was live frogs or toads. I don't think it ever stays about sluggish streams or about ponds. The valley of Walnut, I might add, is much more marshy and the stream itself more sluggish than

The Water Snakes

Crabtree, which condition, I believe, explains why *leberis* shuns that stream and prefers Crabtree."

GRAHAM'S WATER SNAKE

Tropidonotus grabami, (Baird & Girard)

Another of the striped Water Snakes. In size and conformation similar to the preceding species.

Colouration.—The back is dark brown, usually with an indistinct, pale band down the centre, which is narrowly bordered with black. On each side of the body is a broad band of yellow, this in strong contrast to the dark colour above it; the yellow band covers the first three rows of scales; it is bordered at its lower portion by a black stripe, the same extending along the edges of the abdominal plates; for a short distance behind the head, the yellow band is wider than elsewhere on the body.

The yellow colour extends forward upon the head, and upward to the centre of the eye. The abdomen is yellowish and a black stripe is generally present on its central portion.

Dimensions.—The species attains a maximum length of about a yard. The measurements of rather a small adult, from St. Louis, Mo., follow:

Total Length.....	25 inches.
Length of Tail.....	4 $\frac{1}{2}$ "
Diameter of Body.....	$\frac{8}{8}$ "
Width of Head.....	1 $\frac{7}{8}$ "
Length of Head.....	$\frac{1}{4}$ "

From these measurements it will be observed that the head is small, as compared with the diameter of the body.

Distribution.—The valley of the Mississippi and the Missouri Rivers, from the Great Lakes to Texas (inclusive).

Habits.—Graham's Water Snake is an agile and timid species, frequenting the borders of streams and lakes. Several specimens taken near St. Louis, were hiding under decaying logs, near the edge of a pond; secreted nearby, under chips of bark, were a number of very young specimens.

THE STRIPED WATER SNAKE

Tropidonotus rigidus, (Say)

Very small as compared with other species. Stout in form, with larger head than our other striped water snakes.

Colouration.—Dark brown or olive brown—paler on the



BANDED WATER SNAKE. *Tropidonotus fasciatus*

The common water snake of the southeastern United States. The typical form is characterised by the unbroken transverse bands



RED-BELLIED WATER SNAKE. *Tropidonotus fasciatus erythrogaster*

The present variety of *T. fasciatus* is uniform, rusty brown above and brilliant, immaculate red beneath. Numerous in the Southeast



COMMON WATER SNAKE, *Tropidonotus fasciatus sipedon*

Characterised by the bands on the posterior part of the body breaking into alternating blotches. The common water snake of the Northeast



BLOTCHED WATER SNAKE, *Tropidonotus latifolius transversus*

Told from the typical form by the alternating blotches along the greater length of the body

The Water Snakes

sides—with two narrow black stripes extending along the back. The abdomen is yellow, with two rows of brown or black dots. With occasional specimens the spots on the abdomen follow one another so closely as to produce the effect of two bands, with serrated edges. The under surface of the tail is immaculate.

The top of the head is dark; the upper lip plates (*labials*) are yellow.

Dimensions.—Attains a length of about twenty inches. The width of the head fully equals the diameter of the thickest part of the body.

Distribution.—The distribution of this rather scarce little serpent is not well known, but general observations point to the range being limited to the southeastern portion of the United States, from Pennsylvania to Florida inclusive, the Gulf States and adjacent area to the north.

Habits.—Practically nothing appears to be known about the habits of the species, although it appears to resemble the Queen Snake in actions, and to frequent small brooks as does that species.

CLARK'S WATER SNAKE

Tropidonotus clarkii, (Baird & Girard)

Moderate in size and resembling the closely allied species in outlines.

Colouration.—Dark, olive brown above, with three paler bands. The central band is about three scales wide; those on the sides covering the third, fourth, and a portion of the fifth rows of scales. Beneath, yellowish in the centre and olive on the side of the abdomen; separating these shades is a tinge of reddish brown.

Dimensions.—Attains a length of about a yard.

Distribution.—Western Louisiana; Texas.

Habits.—Little known, but thought to be like the other striped water snakes.

THE WESTERN WATER SNAKE

Tropidonotus validus, (Kennicott)

Rather small in size. Grayish or olive-brown above, uniform, or with series of small black spots on the sides (on the edges of the scales) arranged in lines. *Beneath, uniform yellow.*

The Water Snakes

Distribution.—Mexico, Lower California, Arizona and Utah.

Habits.—The writer has never observed living specimens of this snake, nor is he able to find records of its habits.

THE FLAT-TAILED WATER SNAKE

Tropidonotus compressicaudus (Kennicott)

Moderate in size and thickness of body. *A short distance from its base, and for the space of about a third of its length, the tail is distinctly flattened.* A transverse section of the tail would appear as a decided oval. This portion of the tail suggests that member as having been slightly crushed on the sides. From the flattened portion, the tail very gradually tapers to a slender point.

Colouration.—The pattern is indistinct in mature individuals—and frequently so with the young.

The ground-colour is greenish-gray or ashy-gray, with obscure and irregular darker bands. On some specimens the markings form clouded blotches on the back, and smaller, alternating blotches on the sides. The abdomen is dark gray or brown, with a central series of yellow spots; the chin is darker than the abdomen, with larger yellow spots.

The head is dark, while the borders of the lip plates (both upper and lower labials) are marked with yellow.

Dimensions.—Total Length 22½ inches.
Length of Tail 5½ “
Diameter of Body ½ “
Width of Head 1½ “
Length of Head ½ “

Distribution.—Confined to Florida. One variety is recognised, on which the banded appearance is more pronounced, and assumes the form of black stripes on the neck. It is technically known as *T. compressicaudus ustus*.

Habits.—Beyond the fact that this species is semi-aquatic and very timid—immediately taking to the water when frightened, the habits are generally unknown.

THE BANDED WATER SNAKE; “MOCCASIN”

Tropidonotus fasciatus, (Linn.)

Size large; body very stout. The head is rather flat, and distinct from the neck. The scales of the body are heavily keeled, imparting a dull, lustreless surface.

Colouration.—Owing to considerable variation among specimens of this species, the pattern is rather difficult to describe. It consists of dark bands of moderate width, crossing a pale, brownish ground-colour, which tends to evince a bright shade of red upon the sides. The outlines of the bands on many specimens, however, are ill-defined upon the back, and with such there is the appearance of a dark brown or blackish snake, with oblong or triangular patches of bright red or yellowish-brown upon the sides—which light colour represents the ground-colour between the bands. Extending across the back are a series of narrow, yellowish bands—these represent the interspaces of ground-colour between the darker markings composing the pattern. The abdomen is yellowish-white, with numerous bright red blotches and clouded spots of black and gray.

It is with young or half-grown specimens that the pattern may be distinctly seen. It will, on such, be observed to consist of wavy bands, crossing a pale ground-colour, for nearly the entire length of the body. These bands are considerably wider on the back than upon the sides, thus leaving but a narrow and generally wavy line of the paler hue between them, while on the sides, where they narrow, the interspaces are nearly as wide as the bands themselves. This arrangement explains the peculiar marking of the adult snakes, on which the novice might be led to mistake the general dark hue produced by the obscure bands for the ground colour, and the bright reddish interspaces on the sides, for the markings. Very old specimens are almost uniform black or brown above, but always show the brilliant red blotches upon the abdomen.

*Variations.**—Few serpents evince more variability in colouration than the present species. The width of the bands vary considerably, as does also the ground-colour. In a large series before the writer are the following phases:

- a. Black, with brick-red bars upon the sides. South Carolina.
- b. " " yellow " " " " " "
- c. Black, with distinct, narrow bars of brown crossing the back. But faint markings on side. " "
- d. Black, with reddish bars on sides, and yellowish, narrow bands across the back. " "

* Several distinct and constant varieties occur, descriptions of which follow that of the typical form.

The Water Snakes

- e. Yellowish-brown, with chestnut-brown bands crossing the body—all bands distinct. Florida.
- f. Pale green, with jet-black cross bands—representing the most showy specimen of the species the writer has ever examined. “

On young specimens the pattern fades rapidly during their second summer.

Head markings.—The head markings of adults are fairly constant. The top of the head is dark; there is a yellow band running from behind the eye to the angle of the jaw. The lip plates (*labials*) are yellow, with dark borders. Rather in contrast to the dull surface of the body, caused by the coarsely keeled scales, are the smooth head-shields, which are highly polished.

As this snake is frequently confused with the poisonous Moccasin, with which it associates in the Southern swamps, a few words concerning the distinction between these reptiles, may not be amiss. The harmless water snake is more slender than the poisonous reptile, and may be told at once by the red spots on the abdomen; the undersurface of the poisonous snake is straw-colour, with black or gray spots on younger individuals, but indications of red spots are never present. Another important distinction appeals to the arrangement of the plates under the tail. With the harmless reptile these plates are arranged in *two rows*, from the base of the tail to the tip. With the venomous reptile, the plates are in a single row, for nearly two-thirds the length of the tail, while the remaining third to the tip shows a double row. (Illustration; Tails). Moreover the poisonous snake possesses a *large pit* between the eye and the nostril which is not present with any of the innocuous water snakes. It is useful for the student to have a thorough knowledge of these structural differences, for by them, the dangerous “cotton-mouth” may at once be told from the several species of harmless aquatic snakes of the South that appeal to it in colouration and form. (Illustration; Heads).

Dimensions.—The Banded Water Snake is one of the larger species of the genus, often attaining a length of four feet. The figures given, of an adult specimen from Hampton County, South Carolina, represent an average size:

The Water Snakes

Total Length.....	3 feet, 2 inches.
Length of Tail.....	8 "
Diameter of Body.....	1½ "
Width of Head.....	1 "
Length of Head.....	1¾ "

Distribution.—The range of this, the typical form, is from Virginia to the Gulf of Mexico, including the state of Florida where it is very common, thence extending westward to Texas.

Habits.—In habits the various species of banded water snakes are very similar. They never leave the immediate vicinity of water and are characteristic from their habit of resting on the branches of bushes and low trees that overhang the water, into which they quickly plunge when alarmed. If disturbed while upon the bank of a stream and some feet from the water, they almost invariably take to the latter for shelter, even though surrounding shrubbery or rocks offer a safe retreat; diving to the bottom they remain for some time, to finally reappear at some distance from the former spot.

There are few reptiles more shy than these semi-aquatic serpents. If escape be cut off, they assume a threatening attitude by flattening the head and body. At such times they bite viciously and give off a very offensive odour, produced by a secretion contained in glands near the base of the tail and voluntarily emitted by the snake when annoyed. Captive specimens soon become tame and permit themselves to be handled with the utmost good nature. They are among the most hardy of reptiles, subsisting for years upon a diet of frogs, toads, and fishes.

Capable of displaying great agility in the water, these serpents in a wild state feed largely upon fishes, although frogs and toads form part of their diet. Warm-blooded creatures, such as the smaller rodents and birds, so preyed upon many of the larger snakes, are never eaten by the reptiles of this genus, which confine their food entirely to the cold-blooded denizens of the streams and swamps. Though persistently frequenting the vicinity of water in a wild state, they will live and thrive in captivity, with no water, except in small vessels from which to drink. Under such conditions the writer has reared numerous broods of them.

The Banded Water Snake is one of the most abundant snakes of the Southern States. It gives birth to large numbers

The Water Snakes

of living young—broods of forty or even fifty not being of rare occurrence. The female pays no attention to her offspring, which desert her immediately after birth, and within a few days begin feeding upon small fishes. The very young snakes are often found hiding under chips, or flat stones along the edges of streams and ponds.

THE RED-BELLIED WATER SNAKE; COPPER-BELLIED "MOCCASIN"

Tropidonotus fasciatus, variety *erythrogaster*, (Shaw)

Of the three varieties of the banded water snake that merit distinct, varietal names, the present reptile is the most closely related to the typical form, although in the colouration of mature individuals the most unlike it. This relationship is demonstrated by the young; they are vividly banded above, precisely like the young typical reptile; *beneath, however, the abdomen is immaculate and lacks all traces of the red spots that are so numerously present with the latter serpent.* The pattern of the young Red-bellied Water Snake rapidly fades from the time of birth and gives way to the colouration described herewith. In size and form the Red-bellied Water Snake, when adult, in no way differs from the preceding reptile.

Colouration.—Dull, rusty-brown above. Rich and immaculate vermilion or brick-red beneath.

Except in half-grown specimens, there are seldom traces of bands on the back or the sides. With such specimens the red of the abdomen is paler than with adults, and assumes a yellowish tinge on the chin and throat.

A large female specimen captured in an inlet of the Savannah River was of a rich, coral red above, with a faint suggestion of the bands on the sides; the colour beneath was brilliant brick-red. This handsome snake gave birth to a brood of over thirty young, which were reddish-yellow, with jet black, wavy cross-bands.

Strikingly distinct in the colouration of the adults, and fairly constant in the display of its peculiar hues, this serpent is well worthy its varietal name, and is easily recognised.

Distribution.—Along the Atlantic coast the Red-bellied Water Snake does not extend farther north than Virginia. In

The Water Snakes

the Central States it extends northward into Michigan, specimens from which locality are very dark brown or blackish above, while the plates of the abdomen show clouded black edges, which narrow toward the centre. Westward, this snake ranges to Colorado, while it also occurs in northern Mexico. The most strikingly brilliant examples and the greatest numbers occur in South Carolina, Georgia and northern Florida.

Habits.—A large specimen taken by the writer in the “low-grounds” of Hampton County, South Carolina, disgorged, during the excitement attending its capture, eleven “suckers,” three sun fish and a craw fish, or “fresh-water lobster.” The crustacean was of moderate size and armed as it was with a formidable pair of mandibles, must have formed a very awkward object to swallow.

This snake displays much the same habits as the common water snakes with which it frequently associates in the swamps and waterways.

THE COMMON WATER SNAKE, BANDED WATER SNAKE; “MOCCASIN”

Tropidonotus fasciatus, variety *sipedon*, (Linn.)

This is the well-known, dingy brown water snake, energetically stoned by the country boy, as it basks on the branch of a tree, overhanging the water. Its range embraces a greater area than does that of the typical form—covering the Eastern States generally, from southern Canada to North Carolina, and extending westward to Kansas.

Colouration.—Pale brownish or reddish, crossed by wavy, dark brown bands on the forward portion of the body. These bands are much broader on the back, causing the back to appear dull brown, and crossed by narrow lines of pale brown or yellow. Narrowing on the sides, the bands are separated by broad interspaces of the ground-colour, which resemble upright and triangular (usually reddish) bars. *On the latter part of the body the bands break into blotches*, of which there is a series down the back and another series on the sides, *in alternation* with those above. It is this breaking up of the bands on the latter portion of the body that gives the reptile its right to a varietal name. Although the strongly banded appearance of the sides imparts

The Water Snakes

a resemblance to the Southern and typical form, this snake always bears a more decidedly brownish aspect. The abdomen is brilliantly spotted with red, and with black as is the former reptile.

Variations.—Very old specimens lose the pattern and become an almost uniform brown. The young snakes are strikingly marked. They are pale gray, with jet black cross-bands; the abdomen is grayish, and the rich, brick-red spots of the adult are represented by spots of black. During the second year they rapidly take on the brown of the parent.

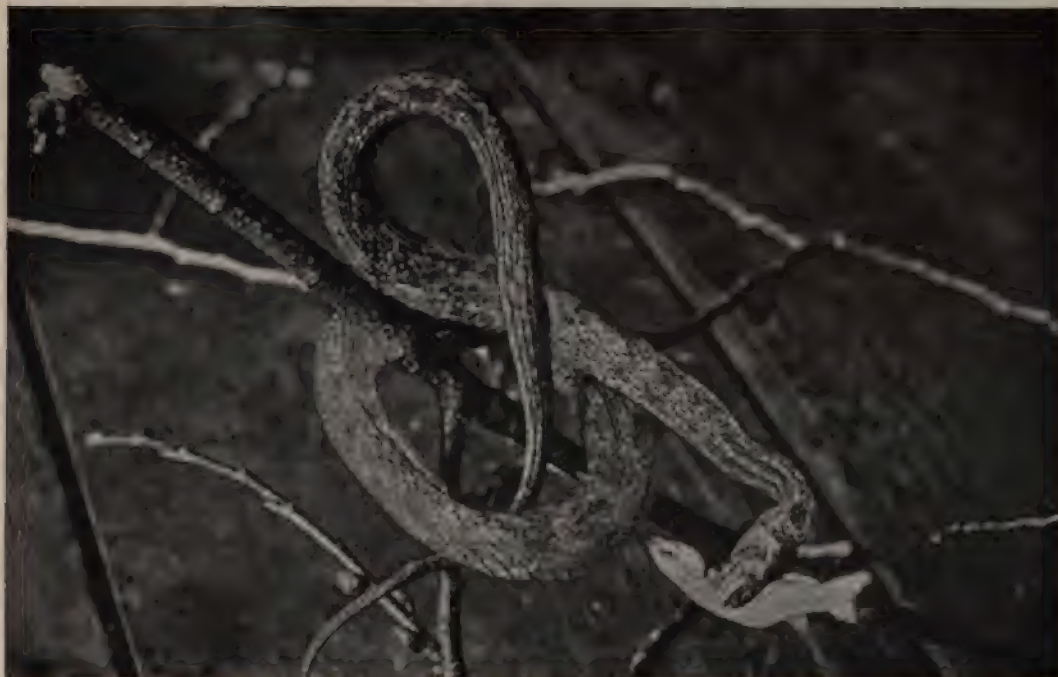
Dimensions.—Female specimens attain a large size and may slightly exceed four feet, but such proportions are above the average. The measurements quoted represent the size of the adult specimen as most commonly seen:

Total Length.....	3 feet, 6 inches.
Length of Tail.....	8 “
Diameter of Body.....	1 $\frac{3}{8}$ “
Width of Head.....	1 “
Length of Head.....	1 $\frac{3}{8}$ “

Distribution.—From Maine and southern Canada to North Carolina (inclusive), and westward to Kansas and Wisconsin. South of North Carolina its place is taken by the typical form and the Red-bellied Water Snake, already described.

Habits.—Owing to its wide distribution in the North, this reptile has been more generally observed than the parent form which, for a great part of its *habitat*, frequents the practically inaccessible swamps of the Southern States. The habits of the Northern form are, however, very similar to those of its Southern relative. Throughout the New England and the Middle States it is an abundant and well-known reptile, frequenting the borders of ponds and streams and making for the water upon the slightest alarm. It is often called “water moccasin” and thought to be very poisonous. In fact its sinister aspect when cornered is anything but reassuring, for it will flatten the head and body to a remarkable degree, when it strikes viciously at every moving object within reach. The heavy body and sombre colour of the upper surface inspire the uninitiated with fear and hatred for this perfectly harmless snake.

When provided with an avenue of escape at the approach of man, the water snake is of lightning speed in taking advantage



FLAT TAILED WATER SNAKE, *Tropidonotus compressicaudus*

Unique among the North American water snakes in having a vertically compressed tail. A small species, apparently restricted to Florida



DIAMOND-BACK WATER SNAKE, *Tropidonotus rhombifer*

A large species of the Mississippi Valley. It infests many of the smaller islands in the Mississippi River



GREEN WATER SNAKE, *Tropidonotus cycloptum*

A ring of scales about the eye distinguishes this species. It is most abundant in Florida and grows to a considerable size for a water snake—four feet



BROWN WATER SNAKE, *Tropidonotus taxispilotus*

Largest of the North American water snakes, reaching a length of five feet. Abundant in the Southern States. An extremely vicious serpent

The Water Snakes

of the opening. My friends of many rambles and snake hunts, Messrs. Adam Dove and Morris Pearsall, relate amusing incidents attending the capture of these reptiles in the lakes of Sullivan County, New York. On one occasion, while fishing for pike, they approached a great mass of derelict timber and on it several large water snakes were sunning. Although the snakes were some twenty feet from where the bow of their boat lightly touched a fallen tree trunk, the vibration was enough to send the reptiles gliding into the water, where they dived at once. Taking three short pieces of fish line, Mr. Dove tied each to branches near the water line, and on the end of each cord securely fastened a small perch, which was dropped into the water, where it hung in plain view. The boat was then rowed some distance away and fishing resumed. About half an hour later, an examination was made of the traps. On each length of string writhed a water snake which had swallowed the perch and fully six inches of the twine. The strings were cut away amid frenzied efforts of the snakes to shake themselves loose, when the reptiles were dropped into a bag and the twine cut close to their mouths. This operation was immediately succeeded by the voracious reptiles, swallowing the string and fish. At no time did the idea of escape by disgorging the fish appear to present itself to the snakes. Many other specimens were captured in this ingenious manner.

It might be explained incidentally that the power of scent is well developed with these reptiles. A cage containing a number of water snakes can be set in a turmoil by simply rubbing a frog or fish across the bottom. The hungry reptiles, catching the scent of the prey, dart wildly about in every direction biting at each other's bodies in their excited search for the food.

The Common Water Snake, like all the snakes of the genus *Tropidonotus*, is viviparous. The largest litter of young snakes counted by the writer amounted to forty-four. Several records of the birth of young snakes are presented; the female specimens involved had been captured but a few weeks.

August	17th.	Brood of 22.	Female from Jersey Meadows, N. J.
September	6th.	" " 28.	" " Greenwood Lake, N. J.
"	10th.	" " 21.	" " " " N. J.
"	13th.	" " 33.	" " Sullivan Co., N. Y.
"	14th.	" " 25.	" " " " N. Y.
"	30th.	" " 23.	" " " " N. Y.

The Water Snakes

THE BLOTCHED WATER SNAKE

Tropidonotus fasciatus, variety *transversus*, (Hallowell)

Another variety of the banded water snake, and rather smaller in size than the preceding.

Colouration.—With this reptile *the pattern of the entire upper surface resembles that of the latter portion of the preceding form*. There is a series of large blotches on the back, separated by narrow lines of ground-colour about one scale wide; on the sides are alternating blotches, separated by brownish or olive spaces wider than the blotches themselves. The abdomen is yellow; the base of each plate is clouded with brown or black.

Distribution.—Appears to be limited to the western portion of Louisiana, Texas and Arkansas.

THE DIAMOND-BACKED WATER SNAKE

Tropidonotus rhombifer, (Hallowell)

Large in size and very stout in form, with very distinct head, on which the lip plates are protruding and swollen, producing a sinister mien. The eyes are placed well forward, toward the snout.

Colouration.—Brown or olive, with a narrow chain of black markings down the back, enclosing diamond-shaped areas of the ground-colour. At the junction of each rhomb the black is widest. From the lower angle of each "diamond" is a band of black, about two scales wide, extending down the side of the body.

The abdomen is yellow, the edges of the abdominal plates being blotched with dark brown, a character more pronounced on the latter portion of the body.

Young specimens are yellowish-brown, with the chain of markings on the back and bands on the side very black and in strong contrast to the ground-colour.

Dimensions.—One of the largest species of the genus, attaining a length of five feet. Following are the dimensions of a fair-sized adult:

Total Length.	4 feet, 1 inch.
Length of Tail.	10 inches.
Diameter of Body.	1 $\frac{3}{4}$ "
Width of Head.	1 $\frac{3}{8}$ "
Length of Head.	2 $\frac{1}{2}$ "

The Water Snakes

Distribution.—Abundant in the lower Mississippi River valley. It occurs from southern Illinois and Indiana into Texas, in which latter state it extends over considerable area; it also occurs in Mexico.

Habits.—Sinister in appearance, this big water snake does not belie its looks. It is usually of a vicious disposition, even after being months in captivity, though hardy and partaking voraciously of frogs and fishes. The species shows a peculiar fondness for climbing, and numbers of captive specimens spent the most of their time coiled and entwined in the branches of a small tree in their cage. Directly beneath these branches was a tank. When living fish were placed in the tank the snakes at once became alert, slipping down quickly from branch to branch, and finally dropping into the tank from a height of a yard or so, when they rapidly swam about with open mouths, in the capture of the fish, which consumed but a few minutes' time. When the tank had been cleared of fish the snakes again ascended the tree to await the assimilation of the meal.

These specimens never became tame, and would flatten their bodies and strike repeatedly at the hand of their keeper if in any way interfered with.

A large specimen from Texas gave birth to sixteen young. These were very large in proportion to the size of the mother. They were fed upon minnows and grew rapidly. Within a year they were but a few inches shorter than their parent.

THE GREEN WATER SNAKE

Tropidonotus cyclopium, (Dumeril & Bibron)

One of the largest of the water snakes, and very stout in form, although the tail is long and tapering. The head is rather long and distinct from the neck; the upper lips exhibit swollen formation, and the eyes are placed rather high, besides well forward, toward the snout. Owing to these outlines and the sombre colours, large specimens appear ugly and formidable. This reptile is closely allied to the diamond-backed water snake. It is *characterised by a ring of small plates around the eye, separating that organ from the lip plates (labials)*.

Colouration.—Dark green or olive brown, with numerous, narrow black bands crossing the back; these bands are about the width of one scale, irregular and wavy and about two scales

The Water Snakes

apart. In alternation with the bands of the back, is a series of black blotches on the sides, which are more pronounced on the latter two-thirds of the body.

With the exception of the lips, which are yellow, the head is of the uniform colour of the body. The abdomen is uniform yellowish with the exception of a tinge of gray upon the edges of the plates.

Although the scales are strongly keeled, this snake is more shiny than other species. In outline and pattern it appeals to the diamond-backed water snake, but may be at once separated by the absence of a tendency of the narrow bands on the back, to unite and form a rhomb-like pattern. Old specimens are generally a uniform, dull olive above.

Dimensions.—Frequently attains a length of four feet. Measurements of a specimen from Lake Kerr, Marion County, Florida, are given:

Total Length.	42 $\frac{3}{4}$ inches.
Length of Tail.	10 $\frac{1}{2}$ "
Diameter of Body.	1 $\frac{3}{8}$ "
Width of Head.	1 "
Length of Head.	2 "

Distribution.—The Gulf States and the Mississippi Valley northward to southern Illinois. In Florida the species is moderately abundant; westward it occurs in lesser numbers and in the Mississippi Valley it is rather rare.

Habits.—In actions this snake resembles the diamond-backed water snake, although it is not so vicious in disposition. Feeding readily in captivity, it is very hardy and will live for years. At times it will lie partially flattened, with head resting upon the ground, causing that member to appear very broad, triangular and ugly. While in such a position it is the personification of a poisonous snake. This serpent is very fond of climbing and if provided with a branch or small tree, will spend much of its time lying stretched upon it.

THE BROWN WATER SNAKE, "WATER RATTLE";
WATER PILOT *

Tropidonotus taxispilotus, (Holbrook)

Largest of the North American water snakes—attaining a length of five feet—very stout of body, but with long, tapering

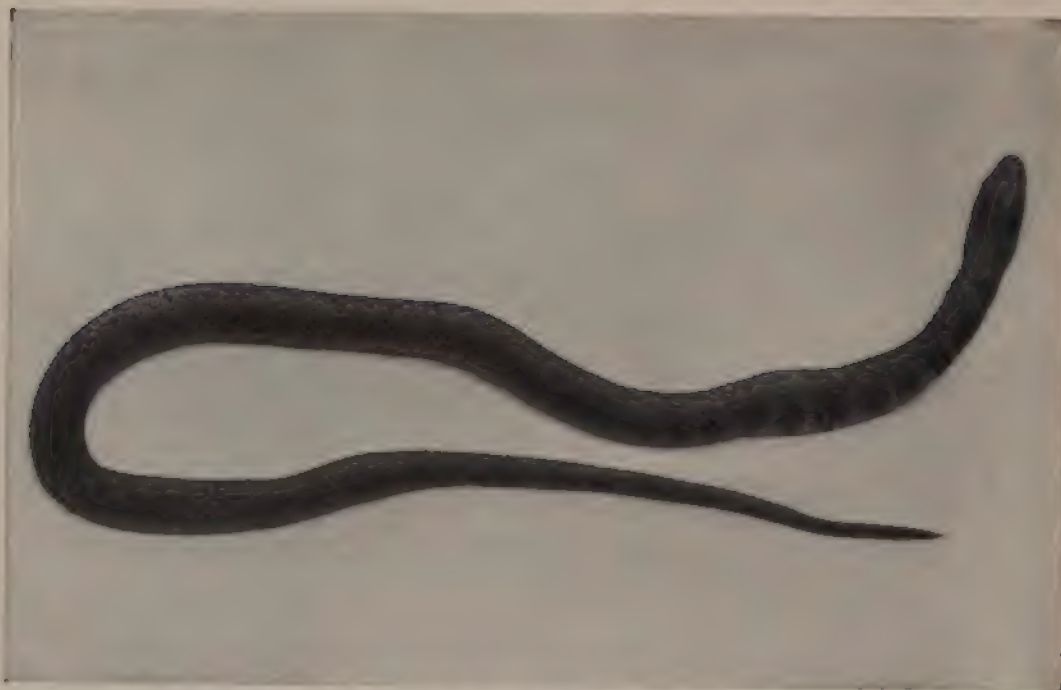
* A name also given to the poisonous Moccasin or "Cotton mouth."



THE HOME OF THE BLACKSNAKE



WHERE THE WATER SNAKES BASK



KIRTLAND'S WATER SNAKE, *Clonophis kirtlandi*
Appears to be a degenerate off-shoot of the water snakes. Burrows in swampy places



STRIPED SWAMP SNAKE, *Tropidodromus lineatum*
Burrows in moist places. The markings are strikingly like those of the striped snakes—*Eutania*

tail. The scales are heavily keeled, and the upper surface is dull and rusty.

The head is very long and narrow beneath the plated portion which only forms about a half its length; behind the plates it widens abruptly, causing it to be very distinct from the neck. The eyes are small and bulging, and situated forward, toward the snout, as well as rather high, which characteristic causes this serpent to resemble the species of East Indian river snakes of the genera *Homalopsis* and *Cerberus*. In a lesser degree, the same characters are evinced by the two preceding species, demonstrating a close relationship.

Colouration.—Rusty brown, with a series of black or dark brown blotches on the back, square in shape; in alternation with them on the sides is a similar series (about four scales wide and six scales high). The blotches of the back and of the sides are not in contact with each other. The effect of this pattern is a very strongly banded appearance, particularly upon the sides. The head is of the uniform colour of the body, and without markings.

Beneath, the colour is yellow, profusely and irregularly blotched with dark brown.

Young and half-grown specimens have a paler ground-colour and black bands. They have the habit of coiling in nearly circular fashion, and when in this position assume a striking similarity to small examples of the banded rattlesnake (*Crotalus borridus*), hence the appellation of "water rattle," which the negroes have given the species.

Dimensions.—Huge examples of this snake were observed in inlets of the Savannah River. Unfortunately, these very large specimens were extremely shy and rendered capture impossible. From this vicinity, snakes of moderate size were taken, these averaging about four feet in length. Although the writer dislikes to speculate upon the size of specimens that have escaped him, he would judge that some of these must have been close to six feet in length. The measurements of an average-sized female are quoted:

Total Length.....	4 feet 2 inches.
Length of Tail.....	12 "
Diameter of Body.....	2 "
Width of Head (over plates).....	$1\frac{7}{8}$ "
Width of Head (at rear).....	$1\frac{1}{2}$ "
Length of Head.....	$2\frac{1}{4}$ "

The Water Snakes

Distribution.—From the Potomac River, southward throughout Florida and westward to the Mississippi Valley (southern portion). The species is particularly abundant in South Carolina, Georgia and Florida.

Habits.—Both in appearance and disposition, this is one of the most ugly of the American snakes. When cornered, it will lie partially coiled, making such rapid darts at every moving object that its actions closely resemble those of a venomous snake. Captive specimens are vicious and sullen. This is in marked contrast to the majority of the water snakes, which exhibit a gentle demeanour after a few weeks in captivity.

In several ways this creature is characteristic. When in the water it has the habit of twisting the tail about the base of an aquatic plant, while the body rears to the surface, in an upright position, the head alone floating flat upon the water.

As a captive, it is rather delicate, the majority of specimens feeding sparingly, others not at all. While inducing specimens of this reptile to eat it is generally necessary to provide a fair sized tank, in which they pass most of their time. Living fish must be introduced and after these they swim rapidly, beneath the surface. The chase after the fish is with open mouth, and the snakes display wonderful agility in capturing the darting prey.

Like the other water snakes, this species produces a large number of living young. These are quite large in proportion to the size of the parent.

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One peculiarity of all the water snakes has been frequently noted by the writer. They are very local in habits and many individuals in a wild state seem to remain for years within a very small area. The writer remembers an instance of a large female specimen of the common water snake, that had taken up her abode in the crevices of a high mill-dam, near a small New England town. A certain rock, which jutted out a foot or more from the dam, was her favourite basking place. Here she would be seen every fine morning, flattened and enjoying the rays of the sun. Frightened from the shelving stone, she would dive into the water, to finally make her way back through crevices in the wall and emerge on her favourite napping place. For several successive years in passing through the district, the

The Water Snakes

writer visited the old and deserted mill to ascertain if the snake was yet there. On each occasion, on a sunny morning, she would be seen as described.

In the South, the water snakes have their favourite roosts on large, derelict tree trunks, where the same individuals may be seen day after day. Many times have we gazed helplessly at these showy reptiles, sunning their thick bodies on logs or branches, some distance from the shore. For during many attempts to effect their capture from a boat, armed with a long pole and noose, it was realised that the reptiles' extreme shyness rendered our approach to within a noosing distance, quite impossible.

One big brown water snake gave us a substantial scare one day, which later showed an interesting trait on the reptile's part. With the guide we were passing through a narrow clearing near the Savannah River. On each side of the clearing, was a series of shallow, marshy pools, over some of which grew a densely tangled brush. There was a sudden thrashing and crash of the brush on our left, causing us all to start with surprise. The guide, an experienced woodsman, declared that nothing but a bear could make so much noise, and promptly sent two blind charges of buckshot into what had been the centre of the disturbance. As silence followed and an extended investigation revealed nothing, we continued on our way.

On returning through the opening in the timber our attention was naturally attracted toward the scene of the morning's incident. When within a hundred feet of the spot the situation cleared, for the cause of the disturbance was very apparent in the shape of a huge specimen of the "water rattle"—brown water snake, lying stretched upon the top of the brush, which sagged perceptibly beneath the creature's weight. As we approached it literally threw itself from the top of the growth, and in a frenzied effort to get below and into the water, thrashed its body violently from side to side and produced a noise that more resembled the progress of a cow through the bushes, than the escape of a serpent.

In passing by this spot daily, for a week or more, we observed this snake on the bushes and each time she escaped us. This fine reptile was at last captured as the result of an interesting condition we discovered shortly after.

The Water Snakes

If a man were on foot, no matter how cautious might be his movements, it was practically impossible to approach the older snakes. The young reptiles and those of moderate size were less wary. *However, if a man were mounted on a horse, the big fellows could be easily approached.* This discovery was at once put to advantage, and our elusive, scaly friend of the clearing was soon on the way North, in the company of many other denizens of the lowgrounds and savannas.



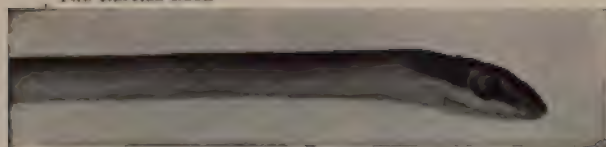
BLACK SWAMP SNAKE, *Seminatrix pygmaea*

Apparently a degenerate water snake. It burrows in moist places. Restricted to the extreme southeastern portion of the United States



ALLEN'S SNAKE, *Liodytes alleni*

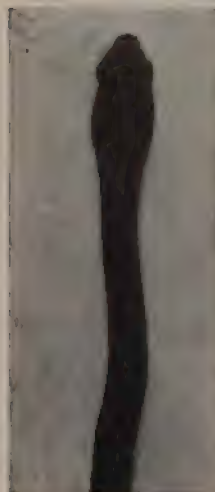
The exact place in classification is doubtful. Occurs in Florida only, burrowing in damp soil. Remarkable in having a very small head. A rare species



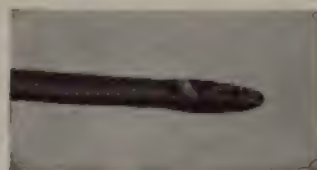
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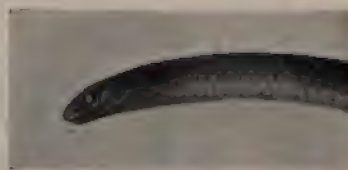
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18

HEADS OF MISCELLANEOUS SMALL SERPENTS

1, 3, 7, 8 The Green Snakes.
 7 and 8 *Liopeltis vernalis*.
 1 " 5 *Cyclophis astutus*.

0 and 17 Brown Snake, *Haida striatula*.
 10 " 11 Worm Snake, *Carphophis amoenus*.
 2 " 5 Valeria's Snake, *Virginia valeria*.

15 and 16 Striped Swamp Snake, *Tropidoclonium lineatum*.
 13 " 18 DeKay's Snake, *Storeria dekayi*.
 12 " 14 Storer's Snake, *Storeria occipitomaculata*.
 * 4 and 6 Ring-necked Snake, *Diadophis punctatus*.

CHAPTER XXVIII: SMALL, MISCELLANEOUS KEELED-SCALED SERPENTS

THE GENERA CLONOPHIS, TROPIDOCLONIUM, SEMINATRIX AND LIODYTES

THE four genera embraced in this chapter seem to be most nearly related to the natracine snakes—the water snakes and striped snakes. As each of the genera contains a single species, they are readily separated, thus:

**Size small.*

‡Scales heavily keeled.

Ventral plate divided. Head not distinct.

Pattern in transverse blotches.

Genus *Clonophis*—*C. kirtlandi*.

Distribution.—Central States.

Ventral plate entire. Head not distinct.

Brown, with three pale stripes.

Genus *Tropidoclonium*—*T. lineatum*.

Distribution.—Central States.

‡‡Body scales smooth; scales on the tail keeled.

Lustrous black; a faint line in the centre of each scale; abdomen red.

Genus *Seminatrix*—*S. pygæa*.

Distribution.—Florida.

***Size moderate.*

Dark brown; a yellowish band on each side; abdomen yellow.

Genus *Liodytes*—*L. alleni*.

Distribution.—Florida.

Detailed descriptions:

The Genus *Clonophis*: This genus is closely related to *Tropidonotus*. It contains a single species. The scales are in 19 rows; all are strongly keeled.

KIRTLAND'S SNAKE

Clonophis kirtlandi, (Kenn.)

Size rather small. Body stout; head not distinct from neck. Looks much like a small *Tropidonotus*, in general outlines.

Small, Keeled-scaled Serpents

Colouration.—Pale brown, with large, upright, blackish brown blotches on the sides, separated by narrow spaces of the ground-colour; two series of less distinct, rounded blotches on the back. The blotches of the sides and the back are in alternation with one another.

Top of the head black; lip plates yellowish.

Central portion of the abdomen, brick-red; bordering this bright hue on either side is a row of dark spots.

Dimensions.—Grows to a length of twenty inches, but most specimens are of smaller proportions. Following are the measurements of a half-grown example, taken near Sandusky, Ohio:

Total Length.....	8½ inches.
Length of Tail.....	2½ "
Greatest Diameter.....	¼ "
Width of Head.....	⅜ "
Length of Head.....	⅜ "

Distribution.—Northern portion of the Mississippi Valley—Ohio, Indiana, Illinois, Wisconsin and Michigan; in some areas the species is as abundant as the garter snakes.

Habits.—The habits appeal to those of the water snakes although this species is not actually semi-aquatic. It frequents damp woods and swamps and may often be found hiding under logs. If surprised when near the edge of a pond or stream it takes to the water without hesitation and dives to the bottom, to hide in the aquatic vegetation, like a true water snake. The food consists largely of small frogs and toads; captive specimens will eat small fishes. Like the water snakes, this reptile produces its young alive.

The Genus *Tropidoclonium*: Closely allied to the preceding genus and separated from it by the structure of the ventral plate, which is entire.

STRIPED SWAMP SNAKE

Tropidoclonium lineatum, (Hallowell)

Size rather small. Form moderately stout; tail short. Head small, pointed, and of the same size as neck; eye small. Scales coarsely keeled.

Colouration.—Grayish brown, with a whitish or yellowish stripe on the back, bordered with black dots; on each side,

Small, Keeled-scaled Serpents

on the 2d and 3d rows of scales, is a similar stripe, though more obscure.

Abdomen white, or yellow, with two rows of black spots.

From above, this serpent looks much like a garter snake (*Eutænia*), but may be told by the smaller head and the rows of black dots on the abdomen. (See accompanying illustration).

Dimensions.—Total Length 14 inches.*
 Length of Tail. $1\frac{3}{4}$ "
 Greatest Diameter. $\frac{3}{8}$ "
 Width of Head. $\frac{5}{8}$ "
 Length of Head. $\frac{1}{2}$ "

Distribution.—The Central States, Ohio to northern Texas.

Habits.—A secretive reptile. In captivity it prefers to hide and is indifferent to food. About this species, Mr. Julius Hurter, of St. Louis, Mo., remarks: "Found along the river front in an abandoned quarry near the Arsenal grounds, in city of St. Louis. They are found under rocks and under sods. In 1892 during the big inundations, I have found hundreds of them drowned and washed against the settling basins of the St. Louis water-works at Bissell's Point. They all came from a tract of low ground above the water-works, about $1\frac{1}{2}$ miles long by about 600 feet wide. This place is covered with rank grass, and in dry weather the ground which is of a boggy kind of black earth, cracks in all directions, thereby forming hiding places."

The Genus *Seminatrix*: The single species inhabits the extreme southeastern corner of the United States. Though closely allied to the water snakes and frequenting damp places, it is a very secretive, almost subterranean reptile. From the typical water snakes it differs in having smooth scales on the body; the scales of the tail are weakly keeled. It is probably a degenerate descendant of *Tropidonotus*, that has adopted an underground life, yet displays traces of the habits of the ancestral forms by living in the vicinity of water.

BLACK SWAMP SNAKE; MUD SNAKE

Seminatrix pygæa, (Cope)

Size rather small. Scales of the body smooth and lustrous; those of the tail faintly keeled. Form rather stout; head not distinct.

* The largest specimen examined was taken near St. Louis; it was 17 inches long.

Small, Keeled-scaled Serpents

Colouration.—The peculiar markings produce the effect of a snake with *keeled* scales. The upper-surfaces are blue-black, each scale shining and opalescent. In the centre of each scale, and particularly noticeable on the sides, is a very narrow and faint line of a pale hue; unless examined very closely, these lines look precisely like keels. Mr. Arthur Erwin Brown remarks: "It is possible that the bright line on the dorsal scales may indicate the former presence of keels, but lately lost."

The sides of the neck are obscurely banded with dull yellow—the bands extending lengthwise.

For the greater part of its length, the abdomen is brick-red, crossed by narrow black bars, but this characteristic is not evident toward the tail.

Dimensions.—The measurements are of an adult, female specimen, taken near Lake Kerr, Marion County, Florida:

Total Length.....	16 $\frac{1}{2}$	inches.
Length of Tail.....	2 $\frac{1}{8}$	"
Greatest Diameter.....	$\frac{1}{2}$	"
Width of Head.....	$\frac{3}{8}$	"
Length of Head.....	1 $\frac{9}{16}$	"

Distribution.—Found only in Florida.

Habits.—The few captive specimens observed by the writer refused such food as young frogs, fishes, earthworms and salamanders. They spent their time in hiding under a piece of bark in their cage. The specimen from which the measurements were taken gave birth to eleven young on the 20th of August; the young were as indifferent to food as the parent; their colouration was exactly like her. They were fond of laying in the water of their drinking dish; their skins were shed under water.

Wild examples are to be found under logs, along the borders of creeks and ponds, or in swamps.

The Genus *Liodytes*: Contains a single species, confined to Florida; it is related to a Central American and Mexican genus—*Helicops*.

ALLEN'S SNAKE; MUD SNAKE; SWAMP SNAKE

Liodytes alleni, (Garman)

Size moderate. Body stout, tapering suddenly toward the neck; head proportionately very small and not distinct from

Small, Keeled-scaled Serpents

the neck. Scales of the body smooth, polished and opalescent; a few rows on the top of the tail are distinctly keeled.

Colouration.—The pattern consists of bands, extending lengthwise. On the back is a broad band of dark brown, occupying the five central rows of scales and a half row on each side; this band also covers the top of the head. On each side of the dark area is a pale olive, or yellowish band, two scales wide and beneath this, another band of the darker hue, the width of $2\frac{1}{2}$ rows of scales. The abdomen, 1st, 2d and one half of the 3d rows of scales, also the upper lip plates, are yellow and immaculate.

Through the courtesy of Dr. Samuel Garman, who originally described this species, the writer has examined the type specimen. Its smooth, shining scales, small, flat head and banded markings, cause it to resemble the Rainbow Snakes (*Farancia* and *Abastor*), though it is not closely related to those serpents. It is a showy reptile, but, like the Rainbow Snakes, leads a burrowing life.

Dimensions.—The measurements were taken from the type specimen:

Total Length.	$24\frac{1}{2}$ inches.
Length of Tail.	$5\frac{1}{2}$ "
Greatest Diameter.	$\frac{3}{4}$ "
Width of Head.	$\frac{1}{2}$ "
Length of Head.	1 "

Distribution.—Known only from Florida. It is a rare serpent.

Habits.—A secretive animal, found hiding under logs in damp places. Captive specimens cannot be induced to feed.

CHAPTER XXIX: THE BROWN SNAKES

Small and Secretive Species, Representing the Genera STORERIA, HALDEA, AMPHIARDIS, and VIRGINIA

SOME of the diminutive snakes included in this chapter are probably degenerate descendants of the group of water snakes. In adopting secretive and subterranean habits they have gradually lost the colours and size of the ancestral forms. These serpents are readily recognised by the dull brown of the upper surface, with but obscure markings or none whatever. Their maximum length is about fourteen inches. They are generally familiar as the little "ground snakes" so often found hiding under flat stones or the bark of decaying trees.

A key to the genera and species is given, together with illustrations of the heads and sections of the body, for the species are so alike in colouration that they are most easily told by their scalation.

The key follows:

- I. Body scales *keeled*.
 - †No loreal plate. Genus *Storeria*.
Brown above; pinkish beneath.
DEKAY'S SNAKE, *S. dekayi*.
Brown above; vermilion beneath.
STORER'S SNAKE, *S. occipitomaculata*.
 - ††A loreal plate.
 - *Two internasal plates. Genus *Amphiardis*.
Brownish-olive above; abdomen white.
GARMAN'S BROWN SNAKE, *A. inornatus*.
 - **One internasal plate. Genus *Haldea*.
Brown above; pinkish beneath.
BROWN SNAKE, *H. striatula*.
- II. Body scales *smooth*.
 - No preocular plate. Genus *Virginia*.
Brown above; yellow beneath.
Scales in fifteen rows. VALERIA'S SNAKE, *V. valeriae*.
Brown above; yellow beneath.
Scales in seventeen rows. VIRGINIA'S SNAKE, *V. elegans*.

The Brown Snakes

The Genus *Storeria*: Four species constitute this genus; two occur in North America and come within the scope of this work; the others inhabit Mexico and Central America.

DEKAY'S SNAKE; BROWN SNAKE; GROUND SNAKE

Storeria dekayi, (Holbrook)

Size small—seldom exceeding twelve inches; body moderately stout, with heavily keeled scales. The eyes are large.

Colouration.—Chestnut or grayish brown; a streak of paler tint on the back, bordered on each side with black dots. Which, on the tail, run together, forming two blackish lines. Abdomen pinkish white.

Colours of the young.—Newly born individuals are very minute. They are dark gray or black, with a ring of grayish-white around the neck. Their dark hue changes rapidly and during the warm months succeeding their first hibernation they acquire the brown of the adult form. Immediately after birth, a snake of this species resembles a young Ring-necked Snake (*Diadophis punctatus*), but may be distinguished by the keeled scales, which impart a dull, velvety lustre. A specimen twenty-four hours old measures $3\frac{1}{2}$ inches in length, and slightly less than an eighth of an inch in diameter at the thickest part of the body. The mother of this specimen was larger than the average adult, measuring fourteen inches in length.

From above, this little reptile looks much like the closely allied species—the Red-bellied Snake or Storer's Snake, but may be at once told by the colour of the abdomen as compared with the vermilion underside of the latter-named species. The bright abdominal colour of the Red-bellied Snake, however, soon fades to a pale yellow when that reptile has for a time been preserved in alcohol, causing it to closely resemble both above and beneath, the DeKay's Snake. Examined closely, a line of slaty gray will be seen to separate the pale tint of the abdomen from the brown of the sides. These gray bands, which when closely inspected will be found to be composed of minute and closely dusted specks of bluish-gray, are prominent on the greater number of specimens of Red-bellied Snakes and form a useful character in separating preserved specimens from those representing the DeKay's Snake which have no trace of such bands.

Dimensions.—The largest specimen of DeKay's Snake

The Brown Snakes

examined measured 15 inches. The following measurements are of an adult of average size, captured in Westchester County, New York:

Total Length.	12 $\frac{1}{2}$	inches.
Length of Tail.	2 $\frac{5}{16}$	"
Diameter of Body.	$\frac{5}{16}$	"
Width of Head.	$\frac{1}{4}$	"
Length of Head.	$\frac{3}{8}$	"

Distribution.—The species is widely distributed and generally abundant. It occurs in southern Canada, and inhabits the entire United States east of the Rocky Mountains, whence it extends southward into Mexico.

Habits.—Very secretive, this little snake usually passes the hours of light hiding among loose stones or under flat rocks, whence it sometimes ventures abroad late in the afternoon, and at such times may be seen crossing country roads. During the early spring it may frequently be found basking in the sunlight. It feeds largely upon earth worms and slugs, in fact the writer has never succeeded in inducing this species to eat anything else, although it is very probable that in a wild state it also feeds upon the smaller salamanders and the soft-bodied grubs of beetles. Although there has been much controversy to the opposite effect, a number of the smaller species of snakes are partially insectivorous in their habits. An examination of the stomachs of a number of very small specimens of the present species, disclosed the presence of various beetles that live under rocks and frequent similar situations as do these reptiles.

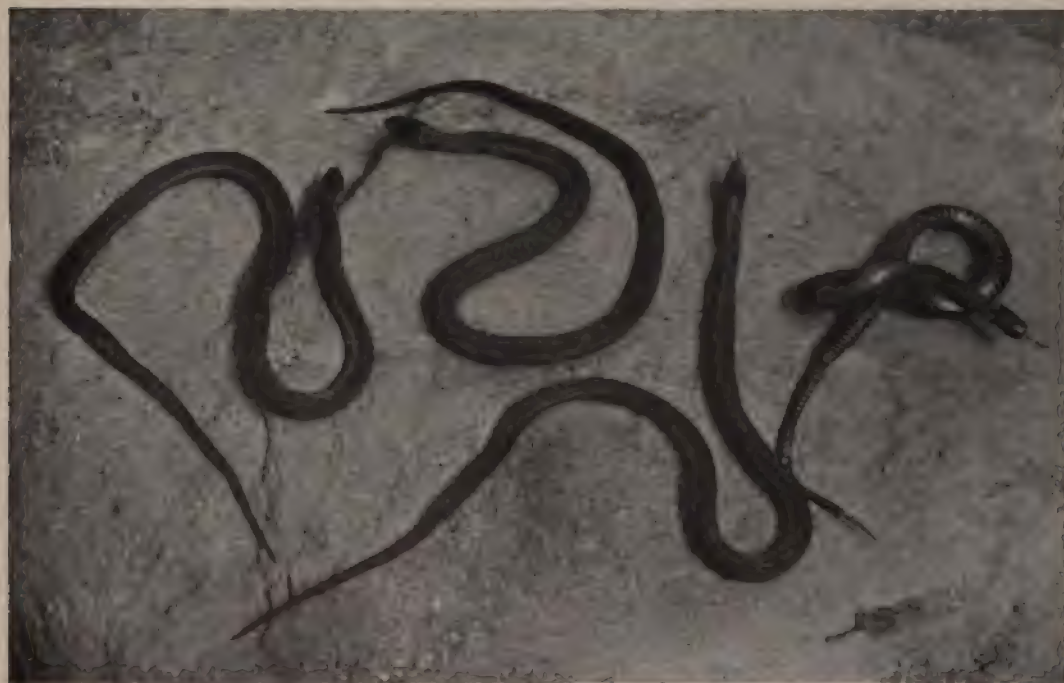
Where other species of snakes have long been exterminated owing to their wandering habits, which lead them into the danger zone of stone and club, this diminutive reptile is yet abundant. Contented with remaining in a small patch of loose rocks or stubble where its food is always to be found, the DeKay's Snake yet exists in moderate numbers even within the limits of the large eastern cities, in parks and upon unimproved pieces of ground.

This snake is viviparous, giving birth to from twelve to twenty young, during the latter part of the summer. Some notes upon the breeding habits are appended:



DEKAY'S SNAKE, *Storeria dekayi*

An extremely common species of eastern North America, living under stones and logs, and feeding largely upon earthworms.



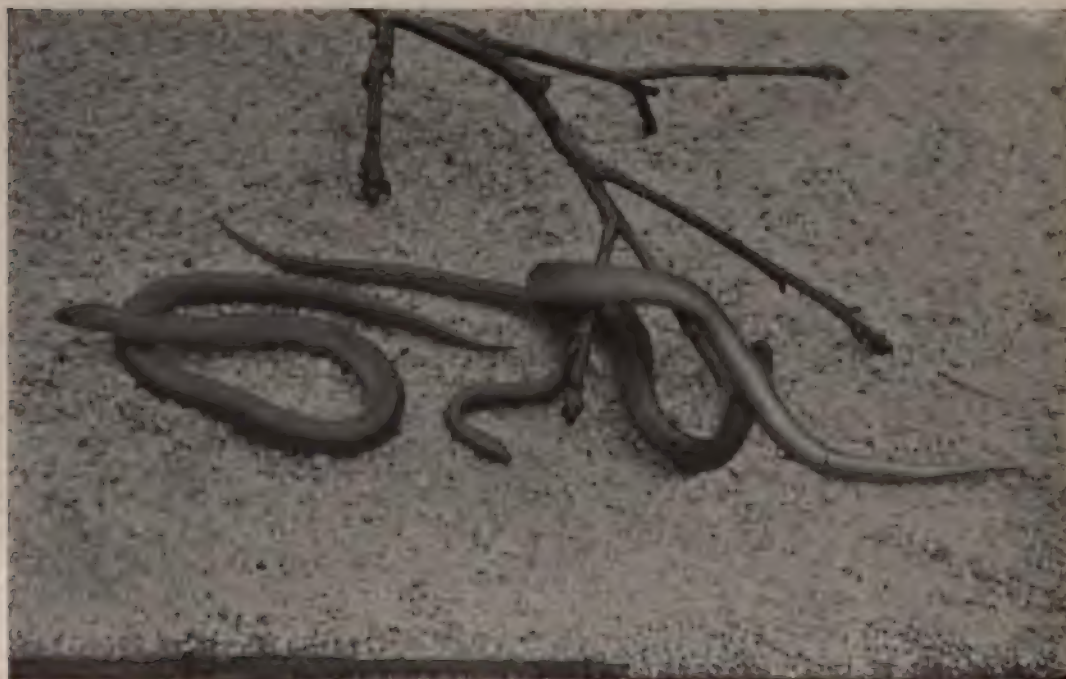
STORER'S SNAKE; RED-BELLIED SNAKE. *Storeria occipitomaculata*

Distinguished from the preceding species in having a vermillion instead of a pinkish abdomen. Abundant in eastern North America.



BROWN SNAKE, *Haldea striatula*

These diminutive brown snakes are extremely common in the southeastern portion of the United States, hiding under bark of decaying trees or under stones and feeding upon earthworms or insect larvae.



VALERIA'S SNAKE, *Virginia valeriae*

Another of the little brown ground snakes. Immediately told by its smooth scales. Secretive in habits.

The Brown Snakes

July 28th.	Brood of 15.	Female from	Westchester Co., N. Y.
" 31st.	" " 18.	" "	Englewood, N. J.
August 5th.	" " 12.	" "	Snake Hill, N. J.
" 8th.	" " 15.	" "	Central Park, N. Y.

STORER'S SNAKE OR RED-BELLIED SNAKE; BROWN SNAKE, GROUND SNAKE, ETC.

Storeria occipitomaculata, (Storer)

Slightly smaller than the preceding species, but similar in general form.

Colouration.—Chestnut brown or grayish above. A streak of paler shade is generally present on the back. *The abdomen is brilliant red*, bordering which colour is a tinge of slate gray on the edges of the abdominal plates.

The head is slightly darker than the body; immediately behind the head is a prominent yellow spot, and each *side* of the neck is a smaller spot of similar colour. These spots at once distinguish this reptile from the preceding and closely related species. Other points of distinction are given in the description of the latter snake.

Colour variations.—Above, individual specimens are inclined to vary to a considerable extent. The commoner form is brown, with a paler band on the back. On some specimens there are rows of indistinct, dark brown spots. Others are of a uniform brown above, with no traces of a paler band, while on each side of the vermilion underside, is a broad band of bluish-gray, narrowing the central, red portion to about one-third the width of the abdominal plates.

Occasional specimens are dark gray, or almost black, with a bright yellow band on the back. Such specimens are of a rich crimson on the under surface. Yet another variation is gray with two rows of white dots upon the back. The spots on the neck, however, are seldom lacking and serve to identify any of these varying forms.

Young specimens are very dark brown, or black, with a whitish collar.

Dimensions.—By comparing a large series of the Red-bellied Snake and the DeKay's Snake, the writer is led to believe the former to be a smaller species. The measurements given show an average of an extensive series:

The Brown Snakes

Total Length.....	10	inches.
Length of Tail.....	$2\frac{8}{16}$	"
Diameter of Body.....	$\frac{1}{4}$	"
Width of Head.....	$\frac{3}{16}$	"
Length of Head.....	$\frac{5}{16}$	"

Distribution.—The species inhabits much the same areas as the DeKay's Snake. It is abundant in some portions of southern Canada, and is found over the United States generally east of the Rocky Mountains, whence it extends into Mexico. However, it is not so generally abundant as the DeKay's Snake. It appears to be restricted to certain areas, where it is common, but between which only occasional specimens may be found. In the mountainous regions of New York and New Jersey it is particularly abundant.

Habits.—Very similar in its actions to the preceding species. It hides under flat stones or among loose rocks, venturing abroad late in the afternoon. The food consists of earthworms, slugs and the soft-bodied grubs of beetles. These little snakes live well in a terrarium, where, upon a diet of earthworms, they will subsist for several years, becoming very tame and taking their food from the hand.

The Red-bellied Snake is viviparous, producing from eight to twelve young. The young are so diminutive that a large earthworm appears quite gigantic in comparison. One of these youngsters could coil comfortably upon a dime and leave a perceptible margin all around it. Following are observations upon the birth of several broods:

August 18th.	Brood of	8.	Female from Sullivan County, N. Y.
" 22nd.	" "	7.	" " " " " "
" 23rd.	" "	7.	" " " " " "
" 24rd.	" "	13.	" " " " " "
" 25th.	" "	9.	" " " " " "
" 25th.	" "	8.	" " " " " "
" 26th.	" "	9.	" " " " " "
" 27th.	" "	7.	" " " " " "
" 30th.	" "	7.	" " " " " "
Sept. 4th.	" "	6.	" " " " " "

The average length of these young snakes was three and a quarter inches. Within an hour or so after birth they commenced shedding their skin, after which process they appeared black and velvety.

The Brown Snakes

The Genus *Haldea*: But one species constitutes this genus. It is abundant in the southeastern United States. From its diminutive size, strongly keeled scales and colouration, it looks much like the two preceding species, but the head is more pointed, and the eyes much smaller.

THE GROUND SNAKE OR BROWN SNAKE; WORM SNAKE

Haldea striatula, (Linn.)

Very small, and moderately slender. Although moderately distinct from the neck, the head is very narrow and pointed, with minute, bead-like eyes.

Colouration.—Uniform grayish-brown or reddish-brown above; yellowish-white beneath. There is a pale, indistinct band across the top of the head.

Dimensions.—The measurements are given of an adult, female specimen, from Raleigh, North Carolina:

Total Length.....	11	inches.
Length of Tail.....	1 $\frac{3}{8}$	"
Diameter of Body.....	$\frac{1}{4}$	"
Width of Head.....	$\frac{1}{4}$	"
Length of Head.....	$\frac{7}{16}$	"

Distribution.—This species is widely distributed and generally abundant. In the East it occurs from central Virginia to Florida; in the Central States it is found as far north as Minnesota, thence it extends southward into Texas.

Habits.—During a collecting trip in South Carolina, this small reptile was found to be abundant in wooded districts where the soil was damp. It was discovered under the bark of fallen trees. During three weeks' hunting, not a specimen was seen prowling, a condition pointing to a secretive or burrowing existence; it possibly ventures from the hiding places at night. The food appears to consist of earthworms, the soft-bodied grubs of the wood-boring beetles and possibly the little ground lizard (*Lygosoma*).

In proportion to its small body, the tongue of this snake is very long and when thrown out to its greatest extent and rapidly vibrated, actually imparts a distinct, vibratory movement to the reptile's head and neck. None of the specimens

The Brown Snakes

showed signs of fight. One of the captives gave birth to seven young on the 20th of August.

The Genus *Amphiardis*: A single species is known. It has been taken in Texas only.

The scales are keeled, but shining. Body rather stout; head not distinct; tail short.

GARMAN'S BROWN SNAKE

Amphiardis inornatus, (Garman)

Differs from *Haldea*, in having two *internasal* plates, the stouter body, lustrous scales and different hue both above and beneath. No *preocular* plate, the *loreal* bordering the eye in front. Scales in seventeen rows.

Colouration.—Brownish olive above; abdomen white, the bases of the plates tinged with gray or olive.

Dimensions.—Length from snout to tip of tail, 10½ inches; length of tail 1¾ inches.

Distribution.—But two specimens are known. They were taken near Dallas, Texas.

The Genus *Virginia*: While resembling the preceding reptiles in size, colouring and general conformation, the two species composing this North American genus may be at once told by their *smooth* scales.

VALERIA'S SNAKE ; BROWN SNAKE ; WORM SNAKE ; GROUND SNAKE, ETC.

Virginia valeriae, (Baird & Girard)

Very small, with moderately stout body, and short, abruptly tapering tail. Head pointed and not very distinct from the neck.

Colouration.—Dark chestnut, or grayish-brown, usually with two rows of minute black dots on the back. Abdomen yellowish-white.

This species appeals to the Worm Snake, (*Carphophis*), but the head of that reptile is of the same width as the neck, while the abdomen is *pinkish*. With the present species it will be observed that the head is perceptibly wider than the neck, and the abdomen *yellowish*.

Dimensions.—The measurements of an adult, female specimen, are given:

The Brown Snakes

Total Length.....	7½ inches.
Length of Tail.....	1½ "
Diameter of Body.....	½ "
Width of Head.....	¾ "
Length of Head.....	¾ "

Distribution.—The species occurs rather commonly from Maryland, westward to Illinois, and southward to Georgia (inclusive). In the southern portion of its range, it extends westward to the Mississippi River.

Habits.—Similar to the preceding soberly-coloured and diminutive reptiles, this little snake leads a secretive life. It feeds upon worms and the soft-bodied larvæ of insects that burrow into decaying trees. A female captured in North Carolina on the 10th of August, gave birth to seven young on the 15th of the same month. The tiny creatures were not as thick as an ordinary match.

VIRGINIA'S SNAKE

Virginia elegans, (Kennicott)

Size, form and colour like the preceding. The only difference between the two species consists in the narrower scales arranged in a greater number of rows with the present one. If the rows of scales across the body be counted they will be found to number seventeen. With Valeria's Snake the scales are in fifteen rows.

Distribution.—The Central Region—southern Illinois, southward to Texas (inclusive).

CHAPTER XXX: THE RACERS

GENERA *SPILOTES* AND *ZAMENIS*

Large Non-constricting Serpents, Characterised by their Great Agility

SLIM and graceful in form, large of size and very active in their movements, the snakes of the genera *Spilotes* and *Zamenis* have attained, in the popular interest, a certain prominence over many other reptiles, and may be appropriately grouped under a general, popular head—The Racers.

One species of *Spilotes*—the Gopher or Indigo Snake, occurs in the United States. The genus is a small one, in numbers. Most of the species occur in tropical South America. *Zamenis* is a large genus. The species inhabit North America, Mexico and Central America, and the Old World. Four species and several distinct varieties of these snakes occur in the United States. Two of the species inhabit the southwestern portion; the remaining two species range from the Atlantic to the Pacific Coasts.

All of the North American Racers have perfectly smooth scales. Although the body appears powerful enough, none of these snakes evinces the habit of constricting the prey.

A concise table, to assist in identification, follows:

- A. *Scales polished.* One plate (*preocular*) in front of eye.
Ventral plate entire. Genus *Spilotes*
Lustrous black above and beneath.
Chin red.

GOPHER SNAKE; INDIGO SNAKE, *S. corais couperi*.

Distribution.—South Carolina to Florida; westward to eastern Texas and Mexico.

- B. *Scales with dull, satiny lustre.* Two plates (*preoculars*) in front of eye. Ventral plate divided. Genus *Zamenis*.

- a. *No stripes or bands.**

Uniform, slaty black above and beneath; *chin and throat white.*

BLACKSNAKE, *Z. constrictor*.

Distribution.—U. S. east of the Mississippi.

*The key appeals to *adult* representatives of the species.



BLACK SNAKE, *Zamenis constrictor*



BLUE RACER, *Zamenis constrictor flaviventris*



INDIGO SNAKE, *Spilotes corais couperi*



COACHWHIP SNAKE, *Zamenis flagelliformis*



STRIPED RACER, *Zamenis taniatus*

NORTH AMERICAN RACERS



1



3



5



4



2

NORTH AMERICAN RACERS
 1 Black Snake, *Zamenis constrictor*.
 2 Coachwhip Snake, *Zamenis flagelliformis*.
 3 Blue Racer, *Zamenis constrictor flaviventris*.
 4 Blue Racer, *Zamenis constrictor flaviventris*.
 5 Striped Racer, *Zamenis lateralis*.

The Racers

Olive above; pale yellow beneath.

"BLUE" RACER, *Z. constrictor*, variety *flaviventris*.

Distribution.—U. S. west of the Mississippi.

Forward portion of body blackish, becoming pale brown on latter portion; abdomen white.

COACHWHIP SNAKE, *Z. flagelliformis*.

Distribution.—Southern United States.

Entire upper surface dark brown; uniform pink beneath.

PINK-BELLIED RACER, *Z. flagelliformis*, variety *piceus*.

Distribution.—Southern Arizona.

b. *Transverse bands on forward portion.*

Reddish brown, with darker cross-bands on forward portion; abdomen pinkish.

RED RACER, *Z. flagelliformis*, variety *frenatum*.

Distribution.—Southwestern U. S.

c. *Body with stripes, running lengthwise.*

Brown or black—a single (narrow) yellow band on each side of body.

BANDED RACER, *Z. lateralis*.

Distribution.—Arizona and California.

Brown, with two or more narrow, yellow stripes on each side.

STRIPED RACER, *Z. tæniatus*.

Distribution.—Southwestern U. S.

d. *Body with both bands and stripes.*

Brown, with two, narrow yellow stripes on each side.

Wide, dark cross-bands on the back.

ORNATE RACER, *Z. tæniatus*, variety *ornatus*.

Distribution.—Western Texas.

The Genus *Spilotes*: Representing this genus in the United States is one of the largest of the North American serpents. The several species of the genus occurring in tropical South America are the largest of the non-venomous snakes, excepting the great constricting snakes—the *Boidæ*. The species of *Spilotes* are often known as the "Rat Snakes" owing to their fondness for rodents and the agility they exhibit in catching them. Thus, in South America and the West Indies, they are recognised as reptiles of considerable value for man, and are quite strenuously protected. In the tropics it is not an uncommon sight to see them prowling about yards and enclosures, gliding under the houses and in other ways evincing a general familiarity toward man that comes after a period of immunity from danger. While powerful and quick of movement, these large snakes are not

The Racers

constrictors, but subdue their prey by holding it firmly to the ground under a portion of the body and engulfing it at the same time. The species are not striking in their colouration, showing hues of olive, brown or black, but their large size and polished scales render them rather showy among colubrine snakes.

A description is given of the single species inhabiting North America:

THE GOPHER SNAKE; INDIGO SNAKE

Spilotes corais, variety *couperi*, (Holbrook)

As this species attains a length of over eight feet, it must be rated as one of the largest of the North American serpents. The body is moderately stout and the entire scalation is as polished as glass; the high polish of the scales imparts, when the reptile is in a strong light, a blue-black hue—hence the popular name of Indigo Snake. Specimens that have recently cast their skins show all the prismatic colours on the plates of the abdomen, which present a surface like burnished metal.

Colouration.—Entire upper and under surfaces (with the exception of the chin and sides of head) lustrous black, or blue-black. The chin, throat and upper lip plates are reddish-brown.

Dimensions.—With the exception of the Western species of *Pituophis*—the Bull Snakes and several of the Colubers, this snake attains the greatest length of any of the North American serpents.

Following are the measurements of a fair-sized specimen, from Seven Oaks, Florida:

Total Length.....	6 feet, 11	inches.
Length of Tail.....	13	"
Greatest Diameter.....	2	"
Width of Head.	1½	"
Length of Head.....	2½	"

The largest specimen examined by the writer was measured as follows:

Total Length.....	7 ft. 9	inches
Length of Tail.....	13½	"
Greatest Diameter.....	2½	"
Width of Head.	1½	"
Length of Head.....	3	"

Distribution.—The Gopher Snake or Indigo Snake is a variety of a large serpent inhabiting tropical South America and Central America. The typical form is pale brown or olive, sometimes dark on the forward portion of the body and becoming bright yellow on the posterior half. It is popularly termed the "Cribo" or the "Rat Snake." A darker variety occurs in northern Central America and Mexico.

The black form (the Indigo Snake) inhabits the Gulf States of North America, occurring in South Carolina, Georgia and Florida, thence westward to the Rio Grande in eastern Texas and into Mexico. Texas specimens have a tendency to show traces of brown upon the tips of the scales, thus appealing to the Mexican variety. Specimens from the extreme eastern portions of the United States—Georgia and Florida—are always uniform black, with the exception of traces of red upon the sides of the head and on the throat.

North American "Black Snakes": From this description it will be noted that the Gopher Snake might appropriately be called a "blacksnake," which is often the case in portions of the reptile's range—but this confuses it with a commoner reptile—the blacksnake, or racer, a species widely distributed and well known under the title. The latter reptile extends its range well into that of the Gopher Snake and its colouration is very similar. A few words will clear this situation.

The Gopher Snake (*Spilotes*), is highly polished—*glassy*—in appearance. The Blacksnake (*Zamenis constrictor*) exhibits a satiny lustre, like the surface of a gun-barrel. The chin and throat of the former species are reddish; the chin and throat of the latter are milky-white.

Another North American *blacksnake* is the Pilot Blacksnake, or Black Chicken Snake (*Coluber obsoletus*). Close examination will show this species to have weakly keeled scales, a character at once distinguishing it from the former reptiles as both have smooth scales.

Habits of the Gopher Snake

Few of the North American serpents are more attractive than the present species. Its smooth, glittering length of blue-black body, flashing with all the prismatic colours along the broad

The Racers

plates of the undersurface, and its good-natured demeanour, combine to make it a favourite in collections.

The Indigo Snake is found in the sandy portions of the southeastern United States and often glides for the burrows of the gopher tortoise when danger threatens—hence one of its popular names—the Gopher Snake. The spectacle of one of these big serpents, trailing its black length over a stretch of light sand is one to arouse the enthusiasm of the naturalist. Powerful and agile, though considerably less active in flight than such ophidians as the blacksnake and the coachwhip snake, it shows little of the viciousness of these creatures. A freshly captured specimen will often submit to handling with a perfect show of good nature, but when surprised in its native haunts, and escape be cut off, the Indigo Snake assumes a position quite unique among serpents. Flattening the head, it compresses the neck for some inches, so that the latter is flattened *vertically*. It then arches the neck slightly, and in this eccentric attitude will strike at the object of its anger. At such times the snake rapidly vibrates the tail. But these exhibitions of bad temper are generally short and spasmodic, and the reptile becomes very tame in captivity, feeding readily from the hand. Contrary to the strength indicated in the stout, though graceful body, the Indigo Snake is not a constrictor, but feeds in the same fashion as the blacksnake, namely, by holding the prey to the ground under a portion of the body and engulfing the animal at the same time.

While most snakes confine their food either to warm-blooded animals, or to other reptiles and batrachians, this species is quite omnivorous, feeding with equal voracity upon small mammals and birds, frogs, toads, lizards, and other snakes. Captive specimens are very fond of small fishes. Few reptiles are so hardy in captivity. A specimen has been in the writer's collection for eleven years. This snake was full-grown when received. The writer has exhibited it to many friends who were prejudiced against snakes, but when noting the complete docility of the handsome creature, have become quickly reconciled to the fact that the actual serpent is a far different animal than the imaginative one. The amateur snake student can select no more satisfactory reptile for observation and study than the Indigo Snake.

The Racers

In the South, it is no rare sight to see one of these large snakes gliding about the immediate vicinity of the dwellings that are removed from the larger towns. In such places the reptiles are regarded as good ratters. Some specimens will remain for years in a certain small area of a plantation, or in the vicinity of the stables, and are almost daily picked up by the children or their elders, who regard them as pets. Such reptiles, accustomed to the sight of man, are devoid of fear and rather seem to enjoy the process of being handled.

The yellow rat snake, or "cribo" of the West Indies and tropical South America, of which species the Indigo Snake is but a northern variety, displays a similar good nature and enjoys the same toleration from mankind. The closely allied rat snakes of India are generally protected, on account of their usefulness in destroying vermin, but are diabolical in temper and usually remain untamable in captivity.

The Indigo Snake is oviparous. Its eggs equal those of a bantam in size.

The Genus *Zamenis*: The snakes of this genus are closely allied to the species of *Spilotes*. They kill their prey in the same fashion—*not by constriction*, but by pressing the animal firmly to the ground, deglutition proceeding at the same time.

THE BLACKSNAKE; BLACK RACER

Zamenis constrictor, (Linn.)

Form moderately slender; tail very long. Head but moderately distinct from the neck; the eyes large. Scales smooth and satiny.

Colouration.—Adult specimens are uniform, slaty black above and beneath—the chin and throat milky-white.

The amount of white upon the chin and throat differs considerably with individuals. It exists to the greater extent on specimens from the Southern States, extending some distance along the throat and covering a considerable portion of the upper lip plates. On specimens from Connecticut, New York, New Jersey and Pennsylvania, the white is usually confined to the chin, and in some instances is to be seen on only a few of the chin plates.

Colouration of the Young.—The young of this species are

The Racers

strikingly different from the parent. They are pale gray above, with a series of large, brownish blotches on the back and numerous black spots on the sides. During their second summer they grow darker and the pattern becomes obscure. In their third summer they acquire the uniform, shiny black of the parent.

Description of a Young Specimen

Pale gray above, becoming whitish on the sides. On the back is a series of large, grayish-brown saddles, which are considerably larger on the forward portion of the body; toward the tail they become narrower and indistinct, owing to the darker hue of the tail. The forward third of the body is profusely spotted with black on the sides and at the edges of the abdominal plates; the abdomen is pale gray. The head is pale, with dark spots and blotches; the eyes are very large. At the time it was described, this specimen was three weeks old; it was twelve and a half inches long and hatched from a litter of ten eggs, collected in Plymouth County, Connecticut.

A specimen about ten inches long, from Marion County, Florida, is pale gray, with dark brown saddles on the back. There are numerous brick-red spots on the edges and centres of the abdominal plates.

Another specimen from Florida, twenty inches long, and presumably about nine months old, is dark gray on the forward third of the body, with distinct, blackish blotches. The posterior two-thirds of the body is very dark and the blotches are invisible.

Young specimens resemble partially grown individuals of the Milk Snake (*Ophibolus doliatus triangulus*), but may be told from the latter by their very large eyes and the absence of black markings on the abdomen, arranged in tessellated fashion.

Variations.—A distinct variety is recognised and described under a separate head.

Dimensions.—A very large Blacksnake is about six feet long. The dimensions given are from a fine specimen, taken in Westchester County, New York:

Total Length.....	5 feet 9 inches.
Length of Tail.....	17½ "
Greatest Diameter.....	1½ "
Width of Head.....	1½ "
Length of Head.....	1½ "

Distribution.—The typical Blacksnake is found in eastern North America, from southern Canada, southward throughout Florida and westward to the prairie regions (not inclusive) of the United States. It is a generally abundant reptile. Westward of the Mississippi the typical form is replaced by a distinct colour variety—the “Blue” Racer.

Habits of the Blacksnake

The Blacksnake is a much overrated reptile—the alleged sworn enemy of the rattlesnake, all-around boss among serpents generally, and a demon in temper. This species is generally described as going considerably out of its way to pick fights with mankind and displaying sufficient strength during these combats to squeeze an arm or limb into a condition approaching insensibility. Besides possessing these formidable habits, the Blacksnake is also described as exhibiting the power of fascinating birds and squirrels—drawing these weak creatures by hypnotic power to within reach of its jaws, when they are enveloped in a crushing embrace.

All this, unfortunately for the writer of romantic snake stories, must be exploded. The Blacksnake has no interest in the rattlesnake or any snake of his size. His only interest in snakes inclines toward individuals much smaller than himself: for his appetite is frequently of a cannibalistic nature. As for going out of his way in a demonstration appealing to mankind, it must be explained that part of the statement is true. The snake goes *considerably* out of his way and usually with a dash like an arrow—but the purpose of such quick movements is to place as much distance between the snake and member of the human race as possible. The Blacksnake is no coward if cornered, and fight be necessary, but few snakes will “pick up and git” with the alacrity and speed of this terrestrial rocket, if escape be possible. Concerning the snake’s powers of hypnotism or “charming” suffice it to say that there are none. And last, but by no means of least importance, is the fact that the Blacksnake, in spite of all the stories of its strength, *is not a constrictor* and has no power to squeeze its prey to death. It feeds upon prey quite small in proportion to the reptile’s size, and swallows the quarry while it is struggling. If the animal be very vigorous, the snake presses it firmly to the ground under

The Racers

a portion of the body, deglutition proceeding at the same time.

This species generally selects rather dry and open situations, being especially partial to the edges of meadows which are fringed along their borders with brush or bushes, into which the snake may dart for shelter. In such places it finds an abundance of birds or the small wild mice that make their nests in the undergrowth or in stone walls, where they are hunted by the snake. The species is commonly observed sunning at the edges of these opens, or sometimes stretched out in the bushes, for it is an agile climber, and although not passing much time above the ground will occasionally ascend to considerable heights in search of nests containing eggs or young birds, being voraciously fond of both. The Blacksnake is also fond of frogs—in fact it might be called an omnivorous serpent.

Having observed the Blacksnake many times afield, the writer feels competent to explain something about its alleged "boldness." While climbing one of the mountains in Pike County, Pennsylvania, he came suddenly upon a specimen on a rocky ledge, engaged in a tussle with a ribbon snake (*Eutania saurita*), which it was endeavouring to swallow. The victim had been grasped by the neck and had so twisted itself about its captor's body that the latter was having anything but an easy time in the engulfing process. Approaching warily, the writer made an attempt to capture both, but the wily "racer" had spied him, and, releasing the ribbon snake from its jaws, dashed through the relaxing coils of the victim and over the cliff. Grasping the bewildered ribbon snake by the tail, the writer saw the Blacksnake dart into the air fully six feet from the rock and drop fifty feet below on a thick growth of bushes, over which it skimmed with bewildering speed for some distance, when it dove into the brush and disappeared. The majority of Blacksnakes seen by the writer have displayed a corresponding alacrity to get away, and to catch them means a quick dash, with outstretched hand, and an indifference to the serpent's teeth: for the moment a specimen is made captive, it displays such dexterity in striking that one must be quick indeed to avoid its passes.

When overtaken on smooth ground, where its undulations do not catch the proper purchase for fast travelling, this species

will turn and strike boldly at the would-be captor. If cornered, it fights bravely, raising the anterior portion of the body from the ground and striking upward to a distance of more than half its length.

While chasing a specimen across a cotton field, the writer observed the snake to start into a crevice of the ground and gave the reptile up for lost. It appeared that the snake was not familiar with the place as the crevice extended but a foot or so. Finding this to be the case, and with only head and neck secreted, the reptile thrashed the exposed part of its body in an hysterical exhibition of rage and excitement, and emerged from the burrow to face the pursuer, the maddest snake he had ever seen. Forgetting the surrounding vegetation, which offered good shelter, it struck a dozen times, and during these antics was made a captive.

After a few weeks in captivity, these snakes lose their nervousness, feed readily and thrive for years. They display rather more intelligence than do most serpents, and will quickly learn to come to the hand that feeds them. The writer once witnessed a remarkable performance on the part of a captive specimen. This snake had been captured more than a year. Taking the creature from its glass-fronted cage, the owner placed it upon the floor, and taking a dead mouse by the tail, offered it to the snake, although he warily kept the rodent about a foot from the ophidian's jaws. Holding the mouse the same distance from the snake, he retreated across the room, the shining creature following in graceful undulations, with head upraised. Up a ladder leading to a loft went the man, the snake quickly ascending the rungs; and then describing a circle on the floor above, the man descended the ladder, the snake sliding after him. Once more in the room, he held the mouse some distance from the floor, shaking it vigorously in one hand, while with the other he reached for his pet, which, quickly climbing to the coveted mouse, seized and began swallowing it while yet in the master's hands. Throughout the entire performance, the snake displayed nothing but eagerness for the mouse—and absolutely no fear of the actions of the man.

The Blacksnake is oviparous—depositing from one to two ozen eggs during June or July. These are frequently secreted under flat stones, on sunny banks, or are laid in soft, moist soil.

The Racers

A captive specimen slightly under five feet in length, deposited eight eggs. These were elongated and cylindrical in shape. They measured at time of deposit $1\frac{1}{8}$ inches in length and $\frac{1}{8}$ of an inch in diameter. (Illustration—Batch of Eggs.) The eggs are snow-white when laid, and have a tough, leathery shell. Each egg, on close examination, appears to have a smooth, satiny surface *sprinkled with coarse grains of salt*. This character distinguishes the eggs of the Blacksnake from those of the great majority of snakes.

The batch of eggs under discussion was placed in a pail containing a composition of decaying pulp from the heart of a dead tree, mixed with *sphagnum* moss—making an excellent hatching medium. Following are several notes taken during the development of these eggs.

July 6th, Eight eggs deposited. *Length* $1\frac{1}{8}$ inches; *diameter* $\frac{1}{8}$ of an inch. On opening one of the eggs it was found to contain a minute embryo, coiled—like the hair-spring of a watch. The eggs were placed in an incubating medium.

July 20th, The eggs have increased in size, but maintain their symmetrical outlines. *Length*, 2 inches; *diameter*, $\frac{3}{8}$ of an inch.

Aug. 15th, The eggs have increased greatly in size, especially in diameter, becoming globular, rather than cylindrical—appearing lumpy and irregular in outlines. On opening one of them, it was found to contain an embryo five inches in length. This is colourless, but shows the scalation to be well formed. The head of the little creature is abnormally large, while the body is so translucent that when held before the light the heart may be seen performing its regular pulsations. The only movement of this immature specimen is a slight twitching of the body.

Sept. 4th, Two snakes emerged from the eggs. They resemble young milk snakes owing to the strikingly blotched pattern. *Length*, $8\frac{1}{2}$ inches; *diameter* $\frac{3}{16}$ of an inch.

Sept. 5th, The remainder of the eggs hatched on this date.

The following valuable information concerning the breeding habits of the Blacksnake is quoted from the notes of Mr. C. S.

Brimley,* to whom the writer is indebted for various suggestions and many interesting living specimens:

"The eggs of the Blacksnake, (*Bascanion constrictor*) are more frequently found than those of any other species of snake. . . . The eggs are free, not adherent to one another in clusters, as is the case with some other species; in size they vary from about 26 to 40 mm. in length, by 21 to 28 in width, and are found in lots of from five to twenty-two in number, the larger lots usually consisting of larger eggs than the smaller lots, from which one would naturally infer that the smaller lots of smaller eggs were probably laid by smaller and younger individuals, and the larger lots of larger eggs by larger and older individuals.

"The eggs must take at least a month to hatch, possibly much longer. A lot of 13 eggs were brought in June 28th, 1900, and four of them were kept until they hatched on July 25th, twenty-seven days later, the young snakes emerging through a longitudinal slit in the egg. Sometimes there are several of these slits; in this lot the markings of the young snakes began to show on those preserved on July 6th, nineteen days before hatching. Another lot of 21 eggs of this species brought in July 11th, 1902, in which the spotted pattern had begun to appear on the embryos, were kept till some of them hatched on July 28th, seventeen days later; three of these young snakes measured respectively 285, 300 and 303 mm. in length. Another lot obtained in 1900 contained among others, one egg which, though entirely normal in external appearance, was very abnormal internally, inasmuch as it contained two embryos, and one of these was a two-headed monster."

Regarding the freak specimen mentioned in Mr. Brimley's notes the writer would explain that he has obtained such creatures from hatching broods of Hog-nosed Snakes (*Heterodon platyrhinus*), King Snakes (*Ophibolus getulus*), and Milk Snakes (*O. doliaetus triangulus*). The eccentric character has also been observed among *viviparous* serpents.

THE "BLUE" RACER; GREEN RACER; YELLOW-BELLIED RACER

Zamenis constrictor, variety *flaviventris*, (Say)

More slender than the typical form—the Blacksnake—and of smaller size.

Colouration.—Bluish-green, pale olive or dark olive above. The abdomen is pale yellow—the chin and throat are lighter.

* The *American Naturalist*, Vol. XXXVII, No. 436, April, 1903.

The Racers

The lightest specimens are from the western portion of the Mississippi Valley. Individuals from the Pacific Region are dull olive.

Dimensions.—The writer's largest specimen is four and a half feet long.

Distribution.—The United States generally, west of the Mississippi River.

Habits.—Like the typical form.

THE COACHWHIP SNAKE

Zamenis flagelliformis, (B. & G.)

Form very slender; tail very long. One of the largest species, attaining a length of eight feet. Head narrow.

Colouration.—Forward portion of the body black, or very dark brown, becoming paler toward the latter half; the tail is pale brown.

White beneath, the plates of the underside showing clouded edges on the neck and throat; plates under the latter portion of the body immaculate white or yellow.

Variations.—Some specimens are sooty-black for two-thirds the length of the body, but become brownish, or dark gray toward the tail. Such are usually from South Carolina, Georgia and northern Florida. Many specimens from southern Florida are pale brown on the head and neck and pale greenish-gray for the greater length of the body. In the extreme West, this species exhibits a decidedly reddish colouration, which variation is described under a separate head.

Young specimens of the Coachwhip Snake are mottled in a fashion similar to the colouration of the young blacksnake, but they retain this spotted pattern to a considerably greater age than the young of the allied species; the pattern may sometimes be discerned on individuals that are almost mature—especially when the skin has been freshly cast. One Western variety retains the pattern throughout maturity; this has been described separately.

Dimensions.—The species attains a length of eight feet, which size represents a very large specimen. Following are the measurements of a specimen from Marion County, Florida:



INDIGO SNAKE, *Spilotes corais couperi*

The largest serpent of the eastern United States, attaining a length of 9 feet. Sometimes called the Gopher Snake as it often takes refuge in the burrows of the gopher tortoise



CRIBO, *Spilotes cornis melanurus*

A north Mexican variety of *S. corais* of South America, more closely resembling the typical form than the variety of the southeastern United



YOUNG OF THE COMMON RACER, *Zamenis constrictor*

As is characteristic with all the species of the genus, the young of the Blacksnake is strongly blotched or banded. The pattern fades into the uniform black of the adult during the second year.



BLACKSNAKE; RACER, *Zamenis constrictor*, Adult—Northern phase

A familiar serpent of the eastern United States. It is not a constrictor, despite the scientific name. Grows to a length of seven feet. As it feeds largely upon small rodents it should be protected by the agriculturist.

The Racers

Total Length	7 ft. 1 in.
Length of Tail	1 " 8½ in.
Greatest Diameter*	1½ inches.
Width of Head	1 " "
Length of Head	2½ " "

Distribution.—The range of the typical form—the Coachwhip Snake—is from South Carolina (inclusive) southward throughout Florida and westward to Arizona; northern Mexico.

In the East the species is not so generally abundant as the blacksnake. During a two weeks' collecting trip in the South, the writer captured seventy blacksnakes, but during the entire period observed but five specimens of the Coachwhip Snake. The species appears to be more abundant in Texas than in the southeastern United States. Many specimens have been received from the vicinity of Brownsville and from San Antonio. Among these Texas specimens were several of a uniform pale green hue.

Habits.—Closely related, the Coachwhip Snake and the blacksnake are very similar in habits. Although the blacksnake is one of the most active of serpents, the Coachwhip Snake is yet more speedy in traversing the ground. This wonderful agility is rendered possible by the reptile's build—exceedingly slim of body. Like the blacksnake, the Coachwhip Snake is also addicted to cannibalism, though it feeds principally upon small rodents, birds and eggs. It will not eat frogs. It is an excellent climber, but not to any extent arboreal in habits, as it frequents rather open, sandy country, where it darts over the ground, if annoyed, with an amazing display of speed. The writer has most commonly seen these snakes among the "sand hills" of Georgia and South Carolina, where the burrows of the gopher tortoise were numerous. The snakes take refuge in these burrows when pursued.

Although feeding readily, this species is one of the few harmless snakes to retain a fierce disposition when captive and resent being handled. When annoyed it vibrates the tail rapidly, partially opens the mouth, and with head raised some distance from the ground, will strike viciously and repeatedly. Owing to its nervous, restless disposition, it requires food more frequently than do many snakes. An adult specimen will consume

* Note the very slender body as compared with the length.

The Racers

several mice or animals of a similar size about every five days. The prey is not constricted.

This species lays from one to two dozen eggs.

THE RED RACER

Zamenis flagelliformis, variety *frenatus*, (Stejneger)

Like the typical form the scales are in seventeen rows. The body is slender and the tail very long.

Colouration.—With this variety, the colours of which are decidedly reddish, the transverse bands of the young are retained through life.

The ground-colour is pale reddish-brown; many of the scales have darker tips and some are narrowly margined with pink. The forward quarter of the body is crossed by dark bands, but these are not very distinct. The greater portion of the abdomen is pink, though this hue is usually mixed with yellow and clouded with gray.

Dimensions.—Smaller than the typical form.

Distribution.—The southwestern United States—Nevada, Utah, Arizona and southern portions of California.

THE PINK-BELLIED RACER

Zamenis flagelliformis, variety *piceus*, (Cope)

Size and conformation like the preceding variety. This form exhibits from seventeen to nineteen rows of scales.

Colouration.—Uniform, dark reddish-brown above; uniform pink beneath.

Distribution.—But a few specimens of this snake are known. All were taken in southern Arizona.

THE BANDED RACER

Zamenis lateralis, (Hallowell)

Slightly stouter than the preceding species. The scales are in seventeen rows. The colouration renders the species very easy to determine.

Colouration.—Dark brown or black, with a single yellow stripe on each side of the body, extending from the neck to the tail. On brown specimens the stripes are narrowly margined with black.

The Racers

The abdomen is yellow; there are a few dark blotches under the chin and throat. Above, the head is dark; there is a pale line from the nostril to the eye; the upper lip plates are pale.

Dimensions.—Attains a length of five, rarely six feet.

Distribution.—Arizona and southern California; probably northern Mexico.

Habits.—The writer has had but one living specimen. It was very nervous and when approached would dash frantically about its cage, its head coming repeatedly in violent contact with the glass as it endeavoured to rush through it. This specimen was twice induced to eat very young birds, but lived only a few months.

THE STRIPED RACER; STRIPED WHIP SNAKE

Zamenis tæniatus, (Hallowell)

Size fairly large; form very slender, with long, tapering tail. Eyes large.

Colouration.—Very dark brown or black, with numerous, narrow yellow lines on the sides. White beneath for the greater portion of the length, but becoming coral pink under the tail. The chin and throat are spotted with black.

On close examination, the scales of the sides will be seen to be *yellow*, with a black line extending through the centre of each; this interruption of the ground-colour imparts the appearance of narrow, yellow lines on a darker ground, as explained in the preceding paragraph. The edges of the abdominal plates usually show an elongated, black spot; these spots form a row on the greater length of the body. The yellow, striped appearance on the sides, is most vivid on the forward portion; toward the latter portion of the body it becomes diffused with the exception of the uppermost bands of pale colour, which form a bright stripe on each side of the back; the tail is usually without traces of stripes.

The head is dark—the edges of the shields narrowly margined with white or yellow; there is a light spot in front and behind the eye; the lip plates are yellow.

Variation.—The species exhibits a certain degree of variation with age, but the presence of *several* light bands on the sides render it easily distinguishable. One distinct variety is described.

The Racers

Dimensions.—Following are the measurements of a fair-sized specimen, captured in Beaver County, Utah:

Total Length.	4 feet, 3 inches.
Length of Tail.	1 foot, $3\frac{1}{2}$ "
Greatest Diameter	$\frac{8}{8}$ "
Width of Head.	$\frac{1}{8}$ "
Length of Head.	$1\frac{1}{4}$ "

Distribution.—The southwestern United States and Mexico. It occurs in California, Utah, western Colorado, Nevada, Arizona, New Mexico and Texas. In Mexico the range is quite extensive.

THE ORNATE RACER

Zamenis tæniatus, variety *ornatus*, (B. & G.).

Differs from the typical form in the colouration.

Pale brown, with stripes on the sides like the typical reptile. On the back are wide, dark cross-bands; these are most distinct on the forward portion of the body and on some specimens are of a distinctly oblong formation.

Distribution.—Western Texas.

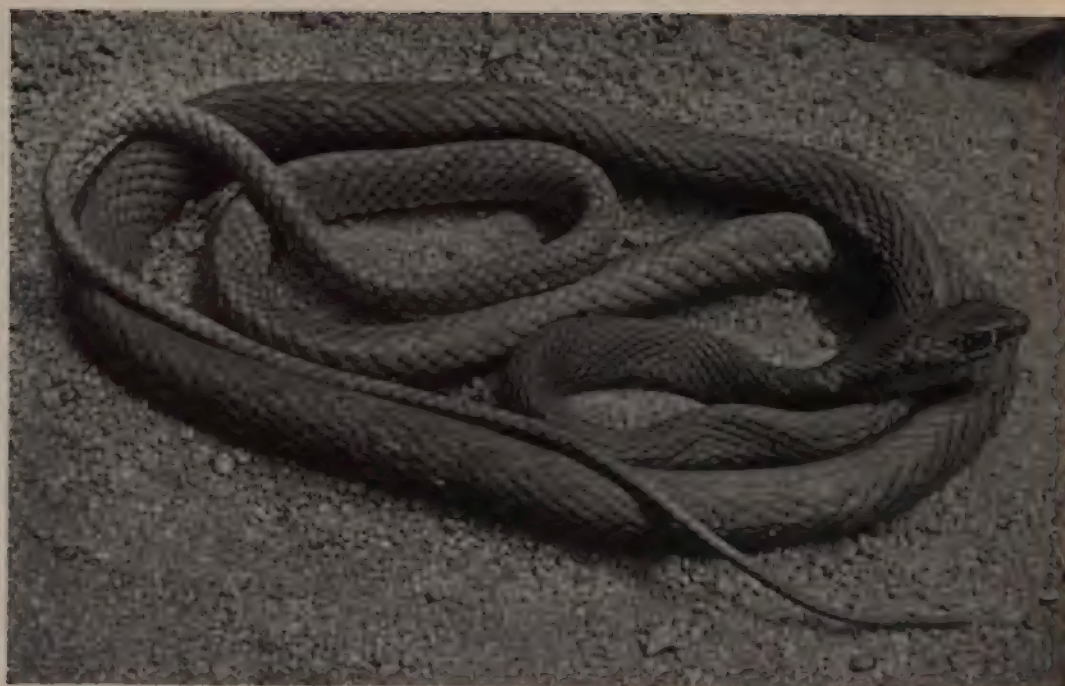
To one who has observed these slender-bodied, graceful serpents literally skim over the ground in their flight for shelter, the comprehensive title for them—the Racers—will appear most appropriate. Like many fleet creatures they are so high-strung and nervous that as captives few of them live long. Among the snakes, they are equivalent to the swallows among the birds.



BLACKSNAKE; RACER, *Zamenis constrictor*—Southern phase
This Southern phase has more white on the chin and lip plates than the Northern Blacksnake



BLUE RACER, *Zamenis constrictor flaviventris*
From the Mississippi Valley to the Pacific Coast the eastern Blacksnake gives way to a greenish or bluish *rettes* active,
having a bright yellow *alslunen*



COACHWHIP SNAKE, *Zamenis flagelliformis*

Acquires the popular name from the very slender body and a sculation that suggests a braided whip. Found in the South, from South Carolina and Florida to California



STRIPED RACER; WHIP SNAKE, *Zamenis lateralis*

Grows to a length of seven feet and inhabits the Southwestern States. An extremely active serpent

CHAPTER XXXI: THE FLAT-NOSED SNAKES

GENERA SALVADORA AND PHYLLORHYNCHUS

Unique Serpents of the Southwestern United States and Mexico

FROM all other North American snakes, the reptiles of the genera *Salvadora* and *Phyllorhynchus* may be distinguished by the peculiar development of the shield on the snout—the rostral. This is wedge-shaped, the flat portion forward, and with sharp, projecting edges. The unusual formation of the rostral gives the head a blunt, square outline. With *Salvadora*, the development is moderate, though at once distinct; with *Phyllorhynchus* however, the formation of the rostral is carried to such an extreme that the two species are extremely grotesque and appear as if they had a curved shield loosely attached to the front of the snout.

The Flat-nosed Snakes are of moderate size; they occur in the southwestern United States and in Mexico.

Key to the North American Species

- A. *Pupil of eye round.* Nose plate (*rostral*) moderately developed in the form of a projecting shield, curved back over the top of the snout. Genus *Salvadora*
Yellow, with brown bands (lengthwise).

GRAHAM'S FLAT-NOSED SNAKE, *S. grahamia*.

Distribution.—Western Texas to Lower California.

- B. *Pupil elliptical.* Rostral plate greatly developed in the form of a projecting shield. Genus *Phyllorhynchus*.

- a. Scales keeled on latter portion of body.

Whitish; about fifteen brown cross-bands.

BROWN'S FLAT-NOSED SNAKE, *P. browni*.

Distribution.—Southern Arizona.

- b. Scales smooth.

Whitish; about thirty blotches on back.

PENINSULA FLAT-NOSED SNAKE, *P. decurtatus*.

Distribution.—Lower California; southwestern Arizona.

The Flat-nosed Snakes

The Genus *Salvadora*: One species of this genus occurs in the United States; several species inhabit Mexico. These snakes are closely allied to the racers—*Zamenis*, and like the latter are very quick in their movements. All inhabit rocky places and feed upon small mammals and birds; they do not constrict their prey. The species are oviparous.

THE BANDED FLAT-NOSED SNAKE; GRAHAM'S FLAT-NOSED SNAKE

Salvadora grabamiae, (Baird & Girard)

Size moderate. Snout blunt and square owing to the peculiar development of the rostral shield, the sides of which are sharp and slightly separated from the head.

Colouration.—On the back is a wide yellow band, extending the entire length of the body; this band is about three scales wide; it is bordered on each side by a dark brown or olive band of about the same width. Beneath the brown band to the edges of the abdominal plates is a greenish or pale brownish area. The abdomen is yellow.

Some variation is evinced by this species. The brown bands may be more or less distinct and with occasional specimens they are broken into rows of dark spots. The head is generally light and without markings above; the lips are bright yellow.

Dimensions.—An adult specimen from northern Chihuahua, Mexico, shows the following measurements:

Total Length.....	2 feet 4 inches.
Length of Tail.....	5 $\frac{3}{4}$ "
Greatest Diameter.....	$\frac{1}{2}$ "
Width of Head.....	$\frac{1}{2}$ "
Length of Head.....	$\frac{3}{4}$ "

Distribution.—Western Texas, New Mexico, Arizona, Utah, Nevada, California and Lower California; the species also occurs in the states of Sonora and Chihuahua, Mexico. It is fairly abundant within the United States.

The Genus *Phyllorhynchus*: The species are quite distinct from those of *Salvadora* and appear to be very rare. The rostral plate is enormously developed; the head is short, thick and chunky and the eye very large, with elliptical pupil.

The Flat-nosed Snakes

The scalation of the head generally—apart from the unusual development of the nose-plate—is interesting and different from the majority of colubrine snakes of this country. Between the eye and the upper lip plates (*superior labials*) is a row of small scales. There are two or three plates in front of the eye (*supraoculars*) and two to four *loreal* plates.

BROWN'S FLAT-NOSED SNAKE

Phyllorhynchus browni, (Stejneger)

Size small and the body slender; head but slightly distinct. The scales on the forward portion of the body are very faintly keeled; on the latter portion the carination is distinct. Tail short—about one-eighth the total length.

Colouration.—Whitish or pale yellow, with fifteen brown blotches on the back which are paler in their centres. Abdomen white. There is a dark bar across the head between the eyes.

No spots on the sides.

Dimensions.—Total length 13 inches; tail $1\frac{3}{4}$ inches.

Distribution.—But two specimens are known. Both were taken near Tucson, Arizona.

Habits.—Nothing is known of the habits. It appears to be a desert animal.

THE PENINSULA FLAT-NOSED SNAKE

Phyllorhynchus decurtatus, (Cope)

Differs from the preceding reptile in having smooth scales and a shorter tail—about one-twelfth the total length; also in the colouration.

Colouration.—Whitish or pale yellow, with about thirty dark blotches on the back and *one or two rows of spots on the sides*.

Dimensions.—Total length $15\frac{1}{2}$ inches; tail $1\frac{1}{8}$ inches.

Distribution.—Lower California and south-western Arizona. But three specimens have been collected and of these only a single individual has been taken within the United States—at Yuma, Arizona.

CHAPTER XXXII: THE RAT SNAKES OR COLUBERS; GENUS *COLUBER*

Large and Powerful Constricting Serpents. They are of Considerable Economic Value in Destroying Animals that are Injurious to Agricultural Pursuits.

IN THE United States the genus *Coluber* is represented by five species and several distinct varieties of large and richly coloured snakes. The genus as a whole contains several dozen species, inhabiting the temperate and tropical portions of both the New and the Old World. For all of these snakes, both for convenience and in the absence of a general, popular title, we will use the name *Coluber*. In some localities of this country they are called "rat snakes" and in others "chicken snakes." All of the species attain a considerable size. Next to the closely allied serpents of the genus *Pituophis* and the big Indigo Snake (*Spilotes*) the *Colubers* are the largest serpents inhabiting the United States.

The *Colubers* exhibit an unvarying preference for warm-blooded prey—especially the smaller rodents, but with few exceptions they also feed upon birds and their eggs. Such North American species as the Red *Coluber* or Corn Snake, the Pilot Black Snake and the Fox Snake are found in considerable numbers in fields of growing grain. Their presence in such places—where the smaller injurious mammals congregate to nest and feed—is obvious, but not appreciated by the average farmer who slaughters the reptiles until their numbers have diminished to a standard far below that intended by Nature. With the destruction of the snakes comes an abundance of the injurious creatures of the fields and the farmer vents his disgruntled feelings to the accompaniment of further reptilian slaughter. The protest of one who appreciates the situation is usually met by the caustic reply that "snakes are snakes" and as such, are fit only for destruction by the hand of humanity. With persons who argue thus, it is a waste of time to talk. Suffice it to say that the farmer who has energetically pursued and



FLAT-NOSED SNAKE, *Salvadora grahamiae*

Closely allied to the racers, but necessarily placed in a separate genus owing to the peculiar development of the snout



FOX SNAKE, *Coluber vulpinus*

Receives its name from a strong-smelling secretion in glands near the base of the tail. A powerful constrictor. Inhabits the Central States. It is useful to the farmer, as it feeds largely upon rats and mice



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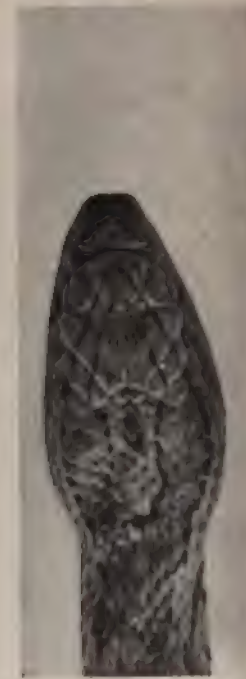
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NORTH AMERICAN COLUBERS

1, 2 Gray Coluber, *Coluber obsoletus confinis*.

3, 4 Chicken Snake, *Coluber obsoletus quadrivittatus*.

5, 6 Fox Snake, *Coluber vulpinus*.

7, 8 Corn Snake, *Coluber guttatus*.

The Rat Snakes or Colubers

clubbed to death the harmless snakes upon his lands, may boast about the extermination of the reptiles, but fails to realise that his labours in setting traps to destroy "vermin" constitute but weak and unsuccessful efforts of the work the snakes have been steadily maintaining.

The Colubers may generally be recognised by the *flattened abdomen*, the crawling-surface forming almost right angles with the sides. The body is moderately stout, the head broad and rather square. The scales of the body are so feebly keeled that with most of the species they appear quite smooth unless very closely examined.

In making up a key for these serpents, the colouration has been employed as the distinguishing character. This popularises the key but throws the species out of the order in which they should be arranged according to their actual relationship. The proper order is preserved, however, in the descriptive list. The colouration in the key appeals only to the adult individuals. The peculiar pattern of the young, of several species, will be described in the succeeding pages.

The key follows: *

- A. A series of large, central blotches and a smaller series on the sides of the body.

*Markings strongly defined.

- a. Markings dark brown or blackish on a yellowish or gray body-colour.

No head bands. Yellowish, with regular, dark brown blotches

RED-HEADED COLUBER; FOX SNAKE, *C. vulpinus*.

Distribution.—Central States.

No head bands. Yellow; black blotches sending out line-like points and assuming an H-shaped formation.

DAVIS MOUNTAIN COLUBER, *C. subocularis*.

Distribution.—Davis Mountains, Texas.

Dark band on side of head. Gray, with dark brown blotches, assuming H-shaped formation on neck.

GRAY COLUBER, *C. obsoletus*, variety *confinis*.

Distribution.—Southern portion of the Central Region and the S. E. United States.

Long, dark band on side of head. Gray, with regular, brown blotches.

EMORY'S COLUBER, *C. emoryi*.

* One other genus—*Rhinechis*, with a single species, is embraced in this chapter; the scales are *smooth*; the colouration is in transverse blotches.

The Rat Snakes or Colubers

Distribution.—Western portion of the Central Region—west of the Mississippi. Kansas to Mexico.

b. Blotches crimson or blackish on reddish ground-color. *Black-bordered head stripes*. Reddish with crimson blotches. Abdomen boldly tessellated with black and white. RED COLUBER; CORN SNAKE, *C. guttatus*.

Distribution.—Southeastern U. S.

**Blotches rather obscure.

Head black. Skin between the scales brick red. Blotches black. Edges of scales between the blotches, yellow.

LINDHEIMER'S COLUBER, *C. obsoletus*, variety *lindheimeri*.

Distribution.—Texas.

B. Black—no blotches.

Edges of the scales sometimes white or yellow. Skin between the scales often brick red.

PILOT BLACK SNAKE; BLACK COLUBER, *C. obsoletus*, typical.

Distribution.—Eastern U. S.

C. Four dark stripes on a pale ground.

Yellow or olive, with four brown or black stripes.

FOUR-BANDED COLUBER; YELLOW CHICKEN SNAKE, *C. obsoletus*, variety *quadrivittatus*.

Distribution.—Southeastern U. S.

In the detailed descriptions herewith given, the student should carefully note the peculiar colour transformation from the young to the adult state, of several of the species. The change is so complete that young individuals are very confusing unless their status is understood.

THE FOX SNAKE; RED-HEADED COLUBER

Coluber vulpinus, (B. & G.)

Stoutest of the Colubers. The tail is very stout, but tapers abruptly to a sharp point. The scales are distinctly, though not heavily, keeled. Attains a length of five or six feet.

Colouration.—Pale brown or yellowish, with a series of large, rich brown blotches on the back and a series of smaller, alternating blotches on the sides; beneath the latter and at the edges of the abdominal plates, is a yet smaller series. The abdomen is yellow, with numerous dusky spots.

There are no head bands and the head is often tinged with ruddy yellow or reddish.

Dimensions.—Specimens six feet long have been recorded, but the writer finds the average of a large series of specimens

The Rat Snake or Colubers

from Ohio, Illinois, and Iowa to be below these dimensions. The measurements of an average-sized adult from Illinois, are given:

Total Length	46½ inches.
Length of Tail	7½ "
Greatest Diameter	1½ "
Width of Head	1½ "
Length of Head	1½ "

Distribution.—The Central States, from Ohio to Minnesota and Nebraska (inclusive); southward to the valley of the Missouri River. The species is quite abundant in Ohio, Illinois and Iowa.

Habits.—Compared with the other Colubers this is a ground-loving species. It is seldom found in trees and its actions in climbing are not nearly so agile as those of most of the succeeding snakes. Occasional specimens are vicious fighters, vibrating the tail so rapidly that the member is blurred in the motion; at such times they double the neck into an S-shaped loop and strike fully a third their length. In striking they emit a sharp, short hiss, sounding like a miniature sneeze. An enraged specimen will retain this position for a quarter of an hour, following with its head the motions of the person who annoys it. However, most specimens of this snake are very good-natured and may be handled with impunity a few moments after capture. They become very tame in captivity and cannot be induced to bite, a demeanour in strong contrast to the erratic disposition of the Pilot Blacksnake (*C. obsoletus*), the Yellow Chicken Snake (*C. obsoletus quadrivittatus*) and many individuals of the beautiful Corn Snake (*C. guttatus*). When newly captured specimens of the Fox Snake are handled, they eject, from glands at the base of the tail, a very strong-smelling secretion, of much the same odour as that noted about the cage of a captive fox: hence the popular name.

The Fox Snake feeds largely upon small rodents—young rats and mice. To procure the former it often haunts the vicinity of barns and sheds where hay or grain is stored. From this habit it is sometimes called the house snake. The fully adult individuals eat mammals as large as half-grown rabbits. They occasionally prey upon birds and will eat their eggs, swallowing them entire and breaking the shell in the throat by a contraction

The Rat Snakes or Colubers

of the muscles. The good this species does in destroying the smaller, injurious creatures of the fields, should cause it to be the recognised friend of the farmer. One snake is worth a dozen traps, for the reptile prowls into the burrows and nests of rats and mice and eats the entire brood.

Like all of the Colubers, the Fox Snake deposits a considerable number of eggs, generally in the hollow of a rotting stump, and leaves them without further ado, to hatch within six or eight weeks' time. The eggs gradually increase in size by absorbing the moisture of the wood pulp in which they are deposited. Just prior to hatching, an egg is a third or half larger than when it was laid. (See Fig.) One of the writer's specimens deposited 12 eggs on the 1st of July. They were adhesive in a single cluster. These eggs began hatching on the 21st of August, and all had not hatched until about ten days later. The female specimen was three and a half feet in length and in proportion to her size the young were very large. The accompanying photograph of a specimen of this brood (beside a rule) illustrates the proportions. The eggs were hatched by placing them in damp, *sphagnum* moss and keeping them in an ordinary room temperature.

As a captive the Fox Snake is hardy and subsists indefinitely upon a diet of mice and sparrows.

EMORY'S COLUBER

Coluber emoryi, (B. & G.)

Smallest of the North American Colubers and the most slender. So fine is the carination of the scales that they appear perfectly smooth unless closely examined; only a few rows on the back are keeled.

Colouration.—Ashy-gray, with a series of rich brown or olive-brown blotches on the back, separated by intervals of one or two scales. These blotches are narrowly margined with black. There is a smaller series of alternating blotches on the side and beneath this a yet smaller series. The abdomen is yellowish-white, with dull gray blotches.

From behind the eye there is a dark band extending past the angle of the mouth to the neck. Immediately in front of the eyes is a dark bar extending across the head. There are two elongated blotches from the back portion of the head to the neck.



PILOT BLACK SNAKE, *Coluber obsoletus*
Sometimes confused with the common blacksnake, but may be told by its keeled scales



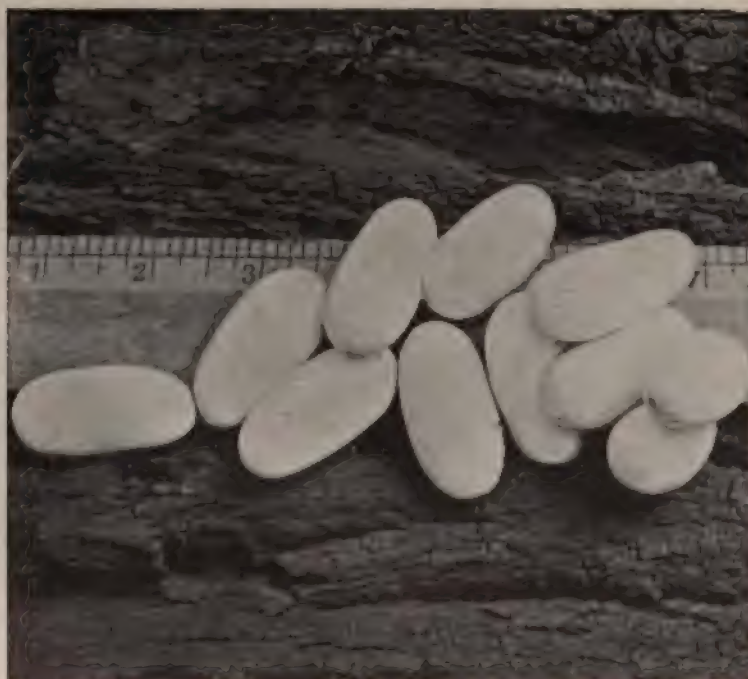
BLOTCHED CHICKEN SNAKE, *Coluber obsoletus confinis*
Its occasional depredations among poultry are superficial as compared with its persistent search for rats and mice. Found in the central and southeastern portion of the United States



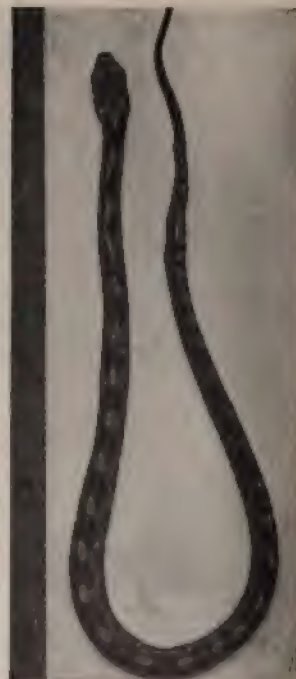
YELLOW CHICKEN SNAKE FOUR-BANDED COLUBER—Adult

Coluber obsoletus quadrivittatus

This fine serpent of the Southeastern States sometimes enters poultry houses, where it eats the eggs and very young fowls. Most frequently, however, its presence in such places is prompted by a search for rats and mice.

EGGS OF FOUR-BANDED COLUBER,
Coluber obsoletus quadrivittatus

During their incubation in wood pulp or decomposing vegetation, the eggs steadily increase in size.



YOUNG OF THE FOUR-BANDED COLUBER

The strongly blotched young show the relationship to the Pilot Blacksnake.

The Rat Snakes or Colubers

Dimensions.—Few specimens are over four feet in length and the greater number are below this size.

Distribution.—States west of the Mississippi River, from Kansas to New Mexico. Common in Texas and known as the "spotted chicken snake" in some districts. The species extends some distance into the state of Chihuahua, Mexico, where it seems to be more abundant than in the United States.

Habits.—Similar to the preceding species. It is not a vicious snake and soon becomes very gentle in captivity. The food consists principally of young rats and mice—sometimes small birds. This snake is a very agile climber and is often found in trees. Captive specimens take immediate advantage of a branch or small tree placed in their cage.

THE DAVIS MOUNTAIN COLUBER

Coluber subocularis, (A. E. Brown)

From a structural view alone, this species is very distinct. Between the eye and the lip plates (upper labials) is a row of several scales. The character at once renders the species unique among the other North American Colubers, as the latter have the upper labial plates in contact with the eye.

Colouration.—Ground-colour rich, orange-yellow on the forward portion of the body; paler in the rear. On the back is a series of square black blotches—about two dozen in number—which send forward and backward from their corners a narrow black band or line. The consequent effect is a series of H-shaped blotches, with wide stems. Toward the tail these blotches become obscure to a degree, but continue as dark spots, of which there are eight on the tail. On each side of the body is a series of quite obscure blotches.

The head is immaculate yellow—the eye large and golden. Beneath, the colour is immaculate yellowish-white.

A half-grown specimen on exhibition in the reptile house of the New York Zoölogical Park was very handsome. The ground-colour was pinkish and the blotches sooty-black.

Dimensions.—The species probably attains a fair size—five or six feet. The conformation is much like that of the Black Coluber (*C. obsoletus*). The few specimens examined by the writer have been young—under three feet in length.

The Rat Snakes or Colubers

Distribution.—Thus far, taken only in the Davis Mountains, southwest of Pecos, Texas. The species was originally described in 1901. Less than a dozen specimens exist in collections. The collector of all these specimens, Mr. E. Meyenberg, is dead. As he collected all of these specimens within a year's time, it does not seem probable that the species is rare. It is merely a coincidence that no one has collected over the territory where Mr. Meyenberg did such good work. Future collectors will probably demonstrate that this snake ranges well into Mexico.

Habits.—Three living specimens have been under the writer's observation. They were young and appeared to be fairly hardy. Mice and young birds were readily devoured. These specimens spent most of their time coiled in the branches of a small tree in their cage. During the time they lived in the reptile house they increased considerably in size.

THE RED COLUBER; CORN SNAKE; RED CHICKEN SNAKE; MOUSE SNAKE; SCARLET RACER; HOUSE SNAKE

Coluber guttatus, (Linn.)

Moderately stout with a proportionately small head. The scales are faintly keeled. Attains a length of six feet.

Colouration.—One of the most beautiful of North American serpents, the species is easily recognised. The ground-colour is pale red. On the back is a series of large, crimson saddles narrowly bordered with black; on many specimens there is a narrow white margin outside of the black; on each side of the body is a smaller series of similar blotches and beneath this a yet smaller series which terminates at the edges of the abdominal plates and shows more of an orange hue than red.

In bold contrast to the markings of the upper surface, the abdomen is white with large black squares.

On the neck and immediately behind the head is a red blotch extending forward in two branches to the top of the head and thence forward to form a wedge-shaped marking terminating between the eyes. A red stripe crosses the forehead and from behind each eye runs a line of similar colour, bordered with black and terminating at the angle of the mouth. The plates of the upper and lower lips are whitish, with black borders.



EMORY'S COLUBER, *Coluber emoryi*
powerful example of the useful, rat-eating snakes—genus *Coluber*. Ranges throughout the western portion of the Central Region, from Kansas to Texas, thence into Mexico



CORN SNAKE, *Coluber guttatus*

One of the handsomest of the North American snakes. The blotches on the back are rich scarlet. Valuable in destroying rats and mice. Inhabits the southeastern part of the United States



SMOOTH-SCALED COLUBER, *Rhinocheilus elegans*

The food consists of small rodents. This species is confined to the states in the Southwest

Variations.—As is the case with most of the Colubers, this species displays a certain amount of variation, both in colour and pattern, but not to a sufficient extent and constancy to warrant the naming of distinct varieties. One sub-species—variety—has been described,* but as specimens of intermediate pattern are continually being found, it is unworthy of separate recognition. At the time of compiling this description, the writer has a living specimen representing this variety, before him. The crimson saddles of the back are very large and the blotches of the sides are so obscure that they can be made out only when the light strikes the specimen at a certain angle. Some specimens have a yellowish ground-colour and on these the crimson blotches are in vivid contrast. The ground-colour varies from pale red, into various shades of yellow, brown or gray. With occasional specimens the blotches of the sides fuse into an irregular band. These phases of colouration do not affect the snake to such an extent, however, that it varies materially or is difficult to recognise.

Dimensions.—The average measurements are given:

Total Length.	51½ inches.
Length of Tail.	7½ “
Greatest Diameter.	1½ “
Width of Head.	1⅜ “
Length of Head	1⅜ “

Occasionally, though rarely, much larger specimens are found. The writer took a specimen in South Carolina, that measured a fraction of an inch over six feet in length. The body was two inches in diameter, and the head very small for a snake of this size—barely one and a quarter inches in width. This fine snake was found hiding in the interior of a decayed and hollow tree trunk that lay in a perfectly open, prairie-like area. In the excitement of capture it disgorged a full-grown quail or “Bob White.” Although the bird did not greatly distend the reptile’s body, it appeared enormous in comparison with the small head of the snake.

Distribution.—The Corn Snake is found from Maryland (inclusive of the District of Columbia) westward to the Mississippi

* *Coluber guttatus sellatus*, (Cope), Desc. *Proc. U. S. National Museum*, XI, 1888, p. 387.

The Rat Snakes or Colubers

River and southward to the Gulf of Mexico. It is most abundant in the extreme Southeastern States.

Habits.—Like the other species of this genus, the Corn Snake is an agile climber and often ascends small trees in quest of young birds, of which it is very fond. It also feeds largely upon small rodents, such as rats, mice and small rabbits and in consequence is a useful reptile. In captivity it always shows an especial fondness for mice, which it will take in preference to all other food.

This snake does not appear to be so arboreal in habits as some of the allied species. The majority of the specimens collected by the writer were on the ground; some lying in hollow logs and others hiding in the shrubbery. While pursuing a sand lizard into some bushes, the writer discovered a large specimen in the act of devouring a quail, which it had undoubtedly stalked from the undergrowth in which the snake had been secreted.

When surprised, the Corn Snake does not ordinarily try to get away, but partially coiling, strikes quickly and viciously, uttering, at each stroke of the head, a sharp, short hiss. In fact, these snakes and the related species are not able to get over open ground with any great show of speed. If foraging, and the enemy is sighted from a distance, they will invariably glide for safety, making for the nearest brush, but if coiled, they do not generally attempt to escape. Either lazy or imagining quiet is a better safeguard than flight, they lie alert, with quivering tongue, watching developments. Generally speaking, the Corn Snake and its allies are bold and powerful reptiles, showing considerable bravery when cornered, and little of the hysterical rush and fluster of most snakes when taken unawares.

The species receives its name from a habit of frequenting fields of growing corn. Its presence there is significant when we consider that numerous rodents collect in such places to feed upon the grain. In some localities the reptile is regarded as useful and harmless, and its life is generally spared. In one district of this kind, the species was known as the "mouse snake." Many specimens were unearthed by the ploughs, during the early spring, showing that in this area—Hampton County, South Carolina—these serpents passed the mild winter in burrows in the fields.

The Rat Snakes or Colubers

In captivity the Corn Snake soon becomes very tame, its good temper combining with the beautiful colouration, in making it an attractive pet. The species frequently breeds when captive and is oviparous, depositing from one to two dozen yellowish-white eggs. These should be placed in dampened wood-pulp in an ordinary living room temperature and will hatch within a period varying from six to eight weeks.

THE PILOT BLACKSNAKE; MOUNTAIN BLACKSNAKE; THE BLACK COLUBER

Coluber obsoletus. (Say.)

One of the largest species. The form is quite stout and the head is rather square in outline—flat at the snout. On the back, the scales are feebly keeled, but the entire body is smooth and glossy in appearance.

Colouration.—Lustrous black above. When the skin is distended the edges of the scales show narrow, milk-white edges, existing profusely in regular order and causing the black to appear as if arranged in a series of large blotches on the back and sides. These white, line-like spots are sometimes mixed with spots of bright red and on such specimens the skin between the scales is of a rich brick-red.

The upper portion of the head is black; the upper lip plates are white, margined with black; the chin and throat are immaculate white. On the forward part of the body the abdomen is white, blotched with gray; on the latter portion the gray fuses over the entire surface.

When examined in a brilliant light, from certain angles, many specimens appear to be of a dark, rich brown, on which body-colour may be clearly discerned the four dark bands, extending the length of the body, that characterise the Yellow Chicken Snake, *C. obsoletus*, variety *quadri vittatus*. Young specimens are grayish or brownish, boldly marked with saddles of black or dark brown.

Variations.—The species exhibits great variation. The typical form is found over a wide area of the eastern United States. In the Central States and the southeastern United States, a gray variety, blotched with dark brown occurs. Also inhabiting the southeastern United States is the four-banded

The Rat Snakes or Colubers

Coluber. These distinct varieties will be treated under separate heads in the succeeding pages.

The typical Pilot Blacksnake is a serpent often confused with the Common Blacksnake or Racer (*Bascanion constrictor*), a reptile to which it bears little resemblance except in presenting a generally black appearance. The difference between these snakes may be briefly outlined for the student's convenience, thus:

- | | | |
|--|---|--|
| a. Scales keeled and <i>polished</i> . | } | Pilot Blacksnake,
<i>Coluber obsoletus</i> . |
| b. Head broad and square. | | |
| c. Black, with white spots on the edge of the scales | | |
| a. Scales smooth, <i>with satiny lustre</i> . | } | Blacksnake; Racer,
<i>Bascanion constrictor</i> . |
| b. Head narrow. | | |
| c. Uniform black. | | |

The Pilot Blacksnake is by no means as abundant a serpent as the Racer.

Dimensions.—Occasional specimens are seven and eight feet long, but they considerably exceed the average dimensions. The measurements of a fine specimen, taken in Sullivan County, New York, are given:

Total Length.....	5 feet, 6½ inches.
Length of Tail.....	11½ "
Greatest Diameter.....	1½ "
Width of Head.....	1½ "
Length of Head.....	2 "

Distribution.—Massachusetts to Florida. Westward in the North to Illinois, and ranging in the South into Texas. In the Northern States this snake frequents mountainous places.

Habits.—A fine specimen captured by the writer, was sunning itself by an opening in the masonry of the "Stone Bridge," over Bull Run Creek, Virginia. Heavily laden with fragments of shells after a trip over the historic battlegrounds, the writer was startled to see the glittering black length of the reptile as it lay on the red dust of the road. Dropping his souvenirs, he rushed for the snake, which, being in the immediate vicinity of escape, started off. By the time the snake had been firmly grasped by the tail, it was a third of its length secreted in a crevice of the masonry, and nothing but long, patient and persistent work suc-



1



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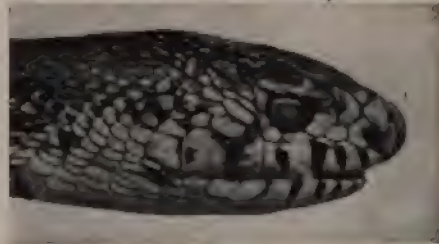
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5



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8

1, 4 Smooth-scaled Coluber, *Rhinocheilus elegans*. Arizona.
5, 6 Pine Snake, *Pituophis melanoleucus*. New Jersey phase.

2, 3 Pine Snake, *Pituophis melanoleucus*. Florida phase.
7, 8 Bull Snake, *Pituophis catenifer*. California.



COMMON PINE SNAKE, *Pituophis melanoleucus*

Found in the dry pine forests of the eastern region, from New Jersey southward. Grows to a length of 8 feet and hisses loudly when angered



PINE SNAKE, *Pituophis melanoleucus*—Southern phase

Differs from the Northern phase in having brownish in place of blackish blotches. A powerful constrictor feeding principally upon rodents

ceeded in getting it out again, when, with commendable bravery, it turned on its captor and fought vigorously. A negro, passing down the turnpike and carrying a scythe, came suddenly upon the exciting spectacle of a man, snake and cannon shells very much mixed up, and at once offered to engage the snake with his weapon. What would have happened to the serpent if the man with the scythe had arrived at the bridge before the writer, is not difficult to guess. An hour later this snake was taken from a bag and exhibited to the wondering family of a farmer. The creature had entirely cast aside its hostile airs, and submitted to handling with perfect docility.

The Pilot Blacksnake, though an admirable climber is not so partial to arboreal situations as some of the colubers. Otherwise its habits are much the same as the allied species. It deposits a like number of eggs.

The serpent receives its name—Pilot Blacksnake—from the fallacious idea that it warns the poisonous snakes (the rattlesnake and the copperhead) of the approach of danger and leads them away to safety. This superstition has probably arisen from the fact that the species is found in places frequented by the dangerous snakes in question. In the North it displays a marked preference for mountain ledges, so commonly the abodes of the banded rattlesnake. Here it may be found stretched upon low bushes, from which it throws itself when surprised, with a remarkable display of agility, then glides quickly among crevices in the rock to safety. A fine specimen, slightly over six feet in length and captured in Sullivan County, New York, was taken on the Half-moon Ledge, a place notorious for rattlesnakes; it disgorged a well-grown "cotton-tail" rabbit. At the time it exuded a strong-smelling secretion from glands near the tail; the powerful, musky odour penetrated the clothes of Messrs. Dove and Pearsall, who captured the snake, and remained for some hours, although these gentlemen explain that when afterward being handled the serpent showed no signs of using the scent-glands. It became very tame as a captive, climbing out and over one's shoulders when the door of its cage was opened. No amount of teasing could induce it to bite, although if startled it would frequently vibrate the tail, the tip of which would beat a rapid tattoo on the side of the cage. Some specimens are very erratic and nervous. In fact the majority of the writer's specimens

The Rat Snakes or Colubers

could not be trusted. A specimen 4 feet long deposited 10 eggs on the 26th of June. The eggs were 2 inches long and $\frac{7}{8}$ of an inch in diameter.

LINDHEIMER'S COLUBER

Coluber obsoletus, variety *lindheimeri*, (B. & G.)

Larger in size than the typical (preceding) form. Head flat and square; the eyes large.

Colouration.—The pattern is difficult to describe. It might be explained as an extreme development of the tendency for the scales to show pale edges—this being explained in connection with the preceding serpent. There is a series of large, blue-black blotches on the back and a smaller series on the sides; within these blotches the skin between the scales is of much the same hue as the blotches themselves. Between the blotches the greater number of scales have bright yellow edges and blue-black centres; mixed with these scales are others that have bright red edges; the skin between the scales may be brick-red or yellowish.

The upper surface of the head is black; the lip plates white.

Dimensions.—Attains a length of eight feet. The general conformation is similar to the typical form.

Distribution.—Texas.

Habits.—When first captive these snakes are vicious, vibrating the tail and striking with a sharp hiss. They soon become moderately tame but can seldom be trusted as they are nervous and resent undue familiarity.

A large specimen in the writer's collection thrived for six years' time, when it unfortunately escaped. This snake was very fond of rats and would devour from four to six full-grown individuals at a meal. It would also eat half-grown rabbits, pigeons, young chickens and sparrows. In addition to this varied fare, it exhibited—like all the colubers—a decided fondness for eggs. Six or eight of these (hen's eggs) would be greedily consumed, but, unlike the bull snakes (*Pituophis*), which crush the shells in the throat and swallow the fragments, this serpent usually swallowed the eggs entire. It showed a decided antipathy to dampness and after the cage had been washed would glide about uneasily until it was thoroughly dry—nor would the snake eat, if the cage was the least bit damp. It was after the cage

The Rat Snakes or Colubers

had been washed and the snake was very restless, that the reptile escaped, by prying back one of the sliding doors.

The room was searched when it was discovered that the snake had escaped from the window, carrying several flower pots with it, which were found broken in the yard beneath. A careful detour of the neighborhood resulted in no trace of the reptile. After several months' time it was discovered in a cellar, about half a mile away from the writer's home. A general alarm spread quickly, but failed to reach the owner in time to rescue the snake. Before he arrived upon the scene a party armed with several shotguns and revolvers had killed the "monster" and incidentally broken considerable glass. Into a cellar reeking with gunpowder fumes, the writer was directed by a corps of indignant neighbours. The mangled reptile appeared to be very stout and well-nourished. A mild suggestion to the effect that the snake was perfectly harmless, and had been ridding the place of rats and mice, was met by an emphatic explanation that the use of traps composed a more dignified method of dealing with the pests.

THE GRAY COLUBER; GRAY RAT SNAKE; SPOTTED CHICKEN SNAKE

Coluber obsoletus, variety *confinis*, (B. & G.)

Size and conformation like the typical form. This variety represents a phase on which the markings of the young are retained with maturity.

Colouration.—Pale gray, with a series of large, dark brown saddles on the back; on the neck these blotches are long and send out narrow extensions from their corners, thus assuming an H-shaped formation. On each side of the body is a series of smaller blotches, and beneath this another, smaller series—at the edges of the abdominal plates.

On the back and the sides, numerous scales show white edges when the skin is distended, as seen on the typical form—the Pilot Blacksnake. The head is gray, dotted with black. There is often a dark band in front of the eyes and usually a wide, dark band from behind each eye to the angle of the mouth. The lip plates are white, bordered with black. The eye is silvery.

The Rat Snakes or Colubers

On the forward portion of the body the abdomen is white irregularly blotched and peppered with gray; on the latter portion the abdomen is uniform, dark gray.

Dimensions.—Total Length. 4 feet, 9½ inches.
Length of Tail. 11 “
Greatest Diameter. 1½ “
Width of Head. 1 “
Length of Head. 1¾ “

Distribution.—The variety occurs from Virginia to Florida (inclusive) in the East and is quite common in North and South Carolina. It extends westward to the eastern boundary of Kansas and occurs in Arkansas and eastern Texas.

Habits.—Like the Pilot Blacksnake.

THE FOUR-BANDED COLUBER; BANDED CHICKEN SNAKE; YELLOW CHICKEN SNAKE; YELLOW RAT SNAKE; STRIPED HOUSE SNAKE

Coluber obsoletus, variety *quadrivittatus*, (Holbrook)

This snake attains a length of six and seven feet, but its body is more slender than that of the typical form.

Colouration.—Bright yellow, pale brown or olive, with four dark brown or black stripes—two on the back and one on each side of the body.

The stripes on the sides are usually the width of two rows of scales; those on the back slightly wider than the one row of scales they cover.

The preceding description appeals only to the adult snake. With the young Four-banded Coluber, we have an admirable example of one of a number of species of serpents that undergo a complete colour transformation while attaining maturity.

Upon hatching, a snake of this variety exhibits a vivid pattern, and like that of the adult of the Gray Coluber—*Coluber obsoletus*, variety *confinis*. From this pale gray phase, with dark brown blotches it gradually transforms into a yellow snake, with longitudinal stripes.

Growth and Colour Transition.—One of a freshly deposited batch of eggs from a snake of this kind measures 1½ inches in length, and ¾ of an inch in diameter. It weighs exactly 1 dram and 47 grains. (Fig. Batch of Eggs, with rule.) Before

The Rat Snake or Colubers

hatching, about six weeks later, the eggs have increased a third in size and weight, owing to the constant absorption of moisture during the growth of the embryo. When the eggs are deposited they contain an almost thread-like embryo, coiled like the hair-spring of a watch and with an enormous head—in comparison to the thin body. The little creature is soft, almost jelly-like and devoid of all signs of life. On opening one of the eggs about three weeks after deposition, the young snake is found to be rapidly developing and well-formed; it is white and with large, lumpy head. At this time the scales of the body may be clearly seen. The body is translucent and the heart and larger blood vessels are vividly apparent, the former beating steadily. The young snake displays traces of life by occasional twitchings of the body. If kept moist, it will live for about half an hour after being removed from the egg.

When an egg of the same batch is opened two weeks later the young snake is found to be perfectly formed and exhibiting a distinct pattern. The eggs hatch six or eight weeks after deposit.

A freshly hatched snake of this variety is about $12\frac{1}{2}$ inches long. So different is the pattern from that of the adult that the novice might reasonably pronounce it to be an entirely different reptile. Indeed the pattern is exactly the reverse from the make-up of the mature snake.

The little snake emerges from the egg in August or early in September and the pattern remains much the same until well into the following summer, by which time the reptile has increased from a foot in length to a measurement of about a yard. The body has acquired the characteristic yellow of the parent, although this ground-colour is possibly darker than with maturity. Along the borders of the larger blotches of the back run two smoky and indistinct stripes. Between the blotches on the sides has appeared a dull, smoky hue, indistinctly fusing these together. Although the stripes of the parent have thus intimated their presence, the reptile still presents a blotched aspect quite different from the parent. It yet remains, and essentially, a *spotted snake*. In the late spring of the next year it will be observed to be much altered. The spots of the sides have been obliterated under a dark and unbroken band. On each side of the large saddles of the back—now of

The Rat Snakes or Colubers

a pale olive hue—is a distinct and dark band. At this stage the reptile may be said to display the patterns of both the young and adult phases. From this period, the ground-colour steadily becomes paler, the blotches more obscure and the bands more vivid. The length of time, to complete this transition, varies with the individual. Captivity retards the process. The writer believes that the wild reptile has completed the change within a period of slightly less than three years. A captive specimen, which upon arrival showed both the spots and stripes, changed its pattern considerably by the fading of the former, during eight months' time, when, unfortunately, it was killed by a larger snake and the observations brought to a close.

The length of the adult Four-banded Coluber is slightly over five feet and *usually* specimens of this size are striped on a body-colour of uniform yellow. At the time of writing, however, an interesting individual is at hand. It is nearly six feet in length, and strikingly blotched, while it displays the stripes as well. Two other specimens, neither over three and a half feet long, are banded and show no traces of the blotches. These exceptions may be accounted for by the influence of certain food on the snake's growth. The large (blotched) specimen, probably hatched in a locality where food for all stages of its growth was plentiful and it so rapidly increased in size that the dimensions of a large, adult individual were attained before the pattern had been given sufficient time to go through its transition. The small snakes, to the contrary, evidently hatched in a locality offering little variety of food; their growth was thus stunted although time effected the change in colouration.

It is from the pattern of the young of the Four-banded Coluber, that we trace the relationship of this snake to the Pilot Blacksnake, which, as has been explained, appears dark brown when examined from certain angles in a brilliant sunlight and exhibits traces of four dark bands.

Dimensions.—Adult specimens are quite variable in size. The writer has had many specimens under four feet long that laid fertile eggs. He has also examined specimens considerably over five feet in length. Following are the measurements of the average adult:

The Rat Snakes or Colubers

Total Length.....	5 feet 2 inches.
Length of Tail.....	12 "
Greatest Diameter.....	1 $\frac{1}{2}$ "
Width of Head.....	1 $\frac{1}{8}$ "
Length of Head.....	1 $\frac{3}{4}$ "

Distribution.—The southeastern United States, from eastern North Carolina southward throughout Florida, and westward, in the South, to the Mississippi. The majority of specimens are found in the coastal region, and the variety is particularly abundant in South Carolina, Georgia and Florida. The largest specimens come from Florida.

Habits of the Chicken Snake

This snake is quite arboreal in habits. The writer has observed specimens at a considerable height, in large, live-oak trees. The majority of the specimens captured were in trees or among the rafters of cabins. One was discovered coiled in a hollow of a live-oak formed by an abrupt forking of the larger branches. This fork in the tree was fully twelve feet from the ground, while the trunk of the tree was straight and smooth for this distance without visible means for the snake to ascend from the ground. The tree was isolated from others and the discovery of the snake was incidental to a search for a mocking bird's nest—a ladder having been placed against the trunk as a means of ascent. Another specimen was seen lying stretched upon a branch at least twenty-five feet from the ground. When pebbles and chips were tossed at the snake, it retreated along the branch to the trunk, which was of considerable diameter, and there glided quickly into a hollow. This snake was seen frequently, sunning upon the same branch. A large snake caught by the writer's guide, was crossing the moist ground of a cypress swamp, which had the reputation of being the lurking place of huge Chicken Snakes. Several other specimens of large size were taken there. All were prowling on the surface of the swamp.

The species often makes its abode in the rafters of stables or poultry sheds. In such places it finds an abundance of mice or rats, though it does not hesitate to devour young chickens, or six to eight eggs, swallowing them entire, but as the eggs pass about fourteen inches down the reptile's neck that portion of the body is pressed against the ground and by a strong and

The Rat Snakes or Colubers

steady contraction of the swallowing muscles, the shell of each egg is broken; the fragments are swallowed together with the contents of the eggs, and are digested. Although all of the colubers show a fondness for eggs and swallow them in this manner, the present species is peculiar in being frequently discovered in the neighborhood of the poultry yards; hence its name—the Chicken Snake. In this habit of preying upon domestic poultry and the eggs, the reptile is rivalled by the Pilot Blacksnake (*Coluber obsoletus*), which, in some parts of the South is called the Black Chicken Snake.

Bold, and comparatively fearless as compared with most serpents, the Chicken Snake will frequently move lazily away if surprised, or if cornered, will turn and strike viciously, assuming a position with head and neck raised some distance from the ground, the neck in a close S-loop, ready for a long thrust of the head in the direction of the creature's anger. At such times the tail is so rapidly shaken that the tip appears blurred and produces a distinct whirring sound.

When overpowered and held by the neck this serpent emits a strong, and to many a very offensive odour, coming from a secretion in glands at the base of the tail and voluntarily ejected. The secretion is white and viscid and at once suggests the strong odour about the quarters of a captive fox. Many snakes have this character in making themselves offensive to man, but it exists among different kinds to a greater or less degree, the colubers and the water snakes being particularly noteworthy. It is believed that these scent glands are primarily of use during the breeding season, when one reptile may easily follow the trail or scent of another. Captive specimens of the Chicken Snake become tame and when accustomed to being handled never emit the powerful odour described. They feed entirely upon warm-blooded prey and eggs, always killing the former by constriction before swallowing it. Very young specimens, are less particular. They will eat small frogs, the grubs of beetles, and are cannibalistic. A captive a few weeks old, swallowed several young garter snakes.

The species is oviparous, depositing about two dozen eggs during June or July. A large specimen deposited twenty-two eggs under a piece of bark in her cage, on the 27th of July. To make a snug nest for the eggs, she crawled under the bark and

The Rat Snakes or Colubers

skilfully burrowed out a hollow in the gravel by pushing it out with the sides of her body. This shovelling process consumed fully an hour. The eggs adhered in a cluster and for long intervals the snake would coil under the bank and over the eggs as if to protect them. Eleven weeks after, these eggs began to hatch.

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The theory of fascination as relating to snakes is interesting from the standpoint of the many sensational stories emanating from the belief that the reptiles exert a hypnotic power in obtaining birds and small mammals. Certain observers insist that they have seen the snake robbing a bird's nest and after the young have been swallowed, the parents fluttered closer and closer, seemingly drawn toward the reptile's jaws by an irresistible power to finally share the fate of the offspring. But this is easily explained.

When a snake robs a nest there is naturally a display of defence on the part of the old birds. In their persistent efforts to drive the intruder away, they are frequently bold enough in their advances to peck at the snake's head, when they are seized and eaten. The fluttering toward the snake displays merely the parent's frenzied attempts to protect the home and young.

There are few of us that have gone into the woods that have not noticed the fluster raised by the parent birds when an intruder approaches the nest. Flying down from branch to branch, until they are but a few feet over one's head, they watch every movement of the person beneath. Their actions are very similar to those displayed in the case of the prowling snake, only from the human, they naturally keep a greater distance—with the reptile they are much bolder.

While rowing along a creek in Connecticut, the writer observed an example of "charming" on the part of a snake. Hearing a great chatter raised by a blackbird, he beheld a large water snake stretched lazily on a bush and within a few feet of the bird's nest. Water snakes do not eat birds and the serpent had climbed into the bush for the sole purpose of a sun-bath. Fluttering back and forth in front of the reptile, the mother endeavoured to drive the serpent away, but to no avail. At length she flew directly toward the intruder and perched upon a branch not a foot from the snake's head, where she danced about and

The Rat Snakes or Colubers

raised such a disturbance that the water snake slid disgustedly into the stream and swam away to hunt another resting place. If the serpent had been a bird-eating species, it could easily have grasped the foolish parent and made a meal of her.

The Genus *Rhinechis*: Containing a single species, this genus appears to stand midway between the colubers and the Bull Snakes—*Pituophis*. Scales smooth, in 27 to 31 rows; ventral plate entire. Snout projecting, owing to the enlarged rostral plate. Size moderate; head rather pointed and not very distinct. Body moderately stout.

Above, the rostral plate extends backward, between the two plates that follow it, as with *Pituophis*.

THE SMOOTH-SCALED COLUBER

Rhinechis elegans, (Kenn.)

Colouration.—Pale brown or reddish-yellow above, with a central series of transverse brown spots, eight to nine scales wide and edged with darker brown or black; two alternating series of smaller spots on each side, the lower one indistinct; abdomen immaculate white or yellow.

A dark streak from the eye to the angle of the mouth; a few dots on the forward lip plates; top of head with obscure spots or bands.

Dimensions.—A large specimen is about three and a half feet long; the tail of such an example would be about six inches in length.

Distribution.—Central Texas to southern California; northern Mexico.

CHAPTER XXXIII: THE BULL SNAKES

GENUS PITUOPHIS

*Large Constricting Snakes that are Closely Allied to the Rat Snakes.
Descriptions of the Three North American Species. Their Habits*

CLOSELY related to the fine reptiles of the preceding genus, are the Bull Snakes—Genus *Pituophis*, which, possessing sharply pointed snouts, differ in this conformation from the square, flat heads of the colubers. The scales of the back are moderately keeled, while those of the sides are smooth and polished.

The species of this genus probably attain the greatest size of any of the North American harmless snakes. Their large size, pointed head, and colouration—yellow or white, with dark, square blotches upon the back, render them readily distinguishable.

Three species inhabit the United States and northern Mexico. These may be classed among the most useful reptiles, as they feed upon small mammals that are injurious to man, in the latter's agricultural pursuits.

Owing to one character the Bull Snakes are quite unique among the North American snakes. This is the presence of a peculiar filament of cartilaginous flesh in the mouth, situated immediately in front of the breathing passage. When the snake is angry, the mouth is partially opened, the filament is raised and the breath expelled violently against it. A very loud, hissing sound is thus produced.

A key is given to aid in the identification of the species:

I. *Ground-colour whitish.*

White, with large black or rusty-brown blotches, *some distance apart.* PINE SNAKE, *P. melanoleucus*.
Habitat.—Eastern States.

II. *Ground-colour yellow.*

Yellow, with reddish-brown or black blotches, *at a moderate distance apart.* BULL SNAKE, *P. sayi*.
Habitat.—Central and Western States.

The Bull Snakes

Yellow, with black or brown blotches, which are very numerous and *set closely together*.

PACIFIC BULL SNAKE, *P. catenifer*.

Habitat.—Pacific Coast region.

Detailed descriptions of these species follow:

THE PINE SNAKE OR BULL SNAKE; WHITE GOPHER SNAKE

Pituophis melanoleucus, (Daudin)

Size large and form moderately stout. In shape, the head of this snake resembles that of a turtle. It is small in proportion to the reptile's size and sharply pointed at the snout, which portion protrudes considerably over the lower jaw. The scales of the back are keeled and lustreless; on the sides they show a highly polished surface. The tail terminates in a hard spine; this, on a large specimen, is three-eighths of an inch in length.

Colouration.—Dull white on the back, becoming intensely white on the sides. Down the back is a series of large, black blotches, closer together and not sharply defined on the forward portion of the body, but on the latter portion, some distance apart and in vivid contrast with the pale ground-colour. There is a row of smaller blotches on each side, and beneath this row (on the edges of the abdominal plates), a row of large black spots. The head is thickly dotted with black. The greater area of the abdomen is immaculate, marble white.

Variation.—The preceding description appeals to the typical Pine Snake, inhabiting the dry, pine woods of the Atlantic Coast and the Middle States. In South Carolina, Georgia and Florida, these snakes altogether lack the striking black and white appearance of the typical form. The extreme Southern snake shows blotches of dull, rusty brown, which are ill-defined. With such specimens the black spots on the edges of the abdominal plates are lacking. Intermediate forms are common, with which the black blotches are present, but contain dull brown centres—hence the Southern Pine Snake is not distinct enough from the typical form to bear a varietal name.

Dimensions.—The Pine Snake is one of the largest serpents of the Eastern States. It attains a length of eight feet. Measure-

The Bull Snakes

ments are given of a specimen of average size, from southern New Jersey:

Total Length.....	5 feet.
Length of Tail.....	8½ inches.
Diameter of Body.....	1½ "
Length of Head.....	1¾ "
Width of Head.....	1 "

Distribution.—Southern New Jersey, and southward throughout Florida; westward to Ohio. This snake is most abundant in the dry, pine woods of the Atlantic Coast region.

Habits of the Pine Snake

From the habit of emitting a very loud and prolonged hiss when annoyed, the Pine Snake and other species of the genus *Pituophis*, differ from the vast majority of snakes. This startling sound is produced by a peculiar arrangement of the *glottis*, which is the air opening, tube-like in form, that is attached to the lower jaw of snakes. In front of the glottis, is an appendage termed the epiglottis; this intensifies the sound of an angry exhalation of the breath in precisely the same fashion as a bit of pasteboard held in front of one's lips and blown upon forcibly. The snake employs the organ to intimidate an enemy. Taking a deep inhalation, it half opens its mouth, and emits the breath with a noise that may be heard for fifty feet or more. To complete a thoroughly hostile air to its antics it usually strikes at the offending object while giving voice to its anger. As the snake's head darts forward the reptile utters a sound that might rival the plunging of a piece of red-hot metal into water. Generally speaking the appearance of one of these snakes in a rage is quite sufficient to excite profound respect in the mind of a person not acquainted with it. During these hostile exhibitions the reptile vibrates its tail so rapidly, that if among dried vegetation it produces a noise similar to that of the rattlesnake.

The Pine Snake is at most a bad-tempered reptile, and although an occasional specimen will become quiet and docile in captivity, the majority of these snakes are morose and sullen and savagely resent familiarity from human hands. The demeanour of captive specimens is such that many specimens refuse to eat and ultimately starve to death.

A powerful constrictor, the Pine Snake feeds upon small

The Bull Snakes

rabbits, squirrels and other rodents. It is very fond of birds and eggs. In swallowing the latter it goes through an interesting performance. The egg is engulfed entire—without breaking the shell—and swallowed for a distance of about eight or ten inches down the neck, when that portion of the reptile is pressed firmly against the ground, the muscles are called violently into play and exert themselves in such a manner that strong pressure is brought against the egg from anterior and posterior directions. Subjected to this compression the shell is broken and the fragments are swallowed along with the contents of the egg, all parts of which are digested. Many of the mammal and bird-eating snakes feed occasionally upon eggs, but they generally consume them entire and await the action of the gastric juices to dissolve the shell, a condition taking place within the space of two or three days. All of the snakes of this genus however go through the performance of breaking the shell before swallowing the egg. A Pine Snake of five feet in length, can easily swallow the eggs of a hen, and will consume from four to six at a meal.

This species is oviparous. The eggs vary from fifteen to two dozen in number.

THE BULL SNAKE "THE YELLOW GOPHER"

Pituophis sayi, (Schlegel)

Very large in size, and rather stout in form. The snout is pointed like the preceding species, but the head is larger in proportion to the reptile's size.

Colouration.—Ground-colour, rich orange-yellow or reddish-yellow, with a row of large, square blotches of dark, reddish-brown (or black) on the back, and a series of smaller blotches, of a lighter shade, along the side.

When the body is distended, the skin will be seen to match the colour of the scales—namely yellow, between the yellow scales, and reddish between the scales comprising the blotches.

The head is dark yellow, with a brown or black band across the top in front of the eyes. Another band extends from the eye to the angle of the mouth, while there is usually a dark bar directly beneath the eye. The lip plates are bordered with black. With this species the abdomen is yellow, with a row of black blotches on each side.

The Bull Snakes

Variation.—The species is subject to but slight variation of colour. Many specimens, however, show narrow, brick-red borders on the scales composing the blotches, while the skin between the scales is of the same colour. The young are much like the parent. A variety, or sub-species, has been recognised. Its description follows that of the typical form.

Dimensions.—Attaining a length of nine feet and a circumference of six inches, this serpent represents the largest species of North American snake. Following are the dimensions of a moderate-sized adult:

Total Length.....	57½ inches.
Length of Tail.....	7½ “
Diameter of Body.....	1½ “
Width of Head.....	1 “
Length of Head.....	1½ “

Distribution.—Widely distributed, the Bull Snake ranges from southwestern Canada southward into Mexico. It occurs as far eastward as the prairie portions of Illinois and is particularly abundant in Texas. It takes the place in the Central and Western States of the Eastern representative of the genus *P. melanoleucus*, and in the extreme West gives way to another species, *P. catenifer*. The range in the United States may be concisely defined as the area between the Mississippi River and the Rocky Mountains.

Habits.—This big, yellow serpent is a familiar reptile among showmen. Owing to the large size and striking colours, large numbers are shipped every spring to the Eastern cities, where they are sold to figure in sensational exhibitions. The majority of such specimens come from Texas.

The species is fairly hardy as a captive, feeding upon rats, rabbits and birds. It is particularly fond of eggs, and consumes them entire, breaking the shell in the throat by a contraction of the muscles. The writer witnessed an illustration of the voracity of one of these creatures. It swallowed fourteen hen's eggs, breaking the shell of each after the egg had passed about a foot down the throat. The demonstration closed by the supply of eggs becoming exhausted and not from any indifference on the reptile's part.

The Bull Snake is oviparous and its eggs rival those of a

The Bull Snakes

hen in size. They are yellowish-white, with a tough, leathery shell.

THE ARIZONA BULL SNAKE

Pituophis sayi, variety *bellona*, (Baird and Girard)

This variety of the preceding reptile is not strongly defined in pattern or colours. The pattern appeals strongly to the typical form, although occasional specimens exhibit markings that tend to place them as intermediate between the Bull Snake of the Central and Western States and the species inhabiting the Pacific Coast region, on which the blotches are smaller and very numerous. This condition tends to render the latter species—*P. catenifer*—rather doubtful, and points to the advisability of considering it but another variation of *P. sayi*.

The principal difference between the present variety (*bellona*) and the typical form consists in the formation of the rostral (nose) plate. With the latter reptile this plate extends upward and is very narrow above; with the former snake (variety *bellona*), it is more bluntly triangular, and lower on the snout.

Dimensions.—The measurements given are of a specimen from Beaver County, Utah:

Total Length.	4 ft. 9 inches.
Length of Tail.	7½ "
Diameter of Body.	1¾ "
Width of Head.	1½ "
Length of Head.	1¾ "

Distribution.—Southern Oregon, Idaho, Colorado, Nevada, Utah, Arizona, New Mexico and western Texas. It also extends southward into Mexico. The Western border of its distribution is the Sierra Nevada range of mountains, west of which boundary occurs the Pacific Coast species, *P. catenifer*.

THE PACIFIC BULL SNAKE, "YELLOW GOPHER SNAKE"

Pituophis catenifer, (Blainville)

Moderately large in size and stout of form, but with proportionately smaller head than the preceding.

Colouration.—Dull yellowish-brown, with small and square reddish-brown (or black) blotches on the back. These blotches



COMMON BULL SNAKE, *Pituophis sayi*
Largest of the North American serpents. Of economic value, as it preys largely upon rodents. Found in the Plains Region and the West

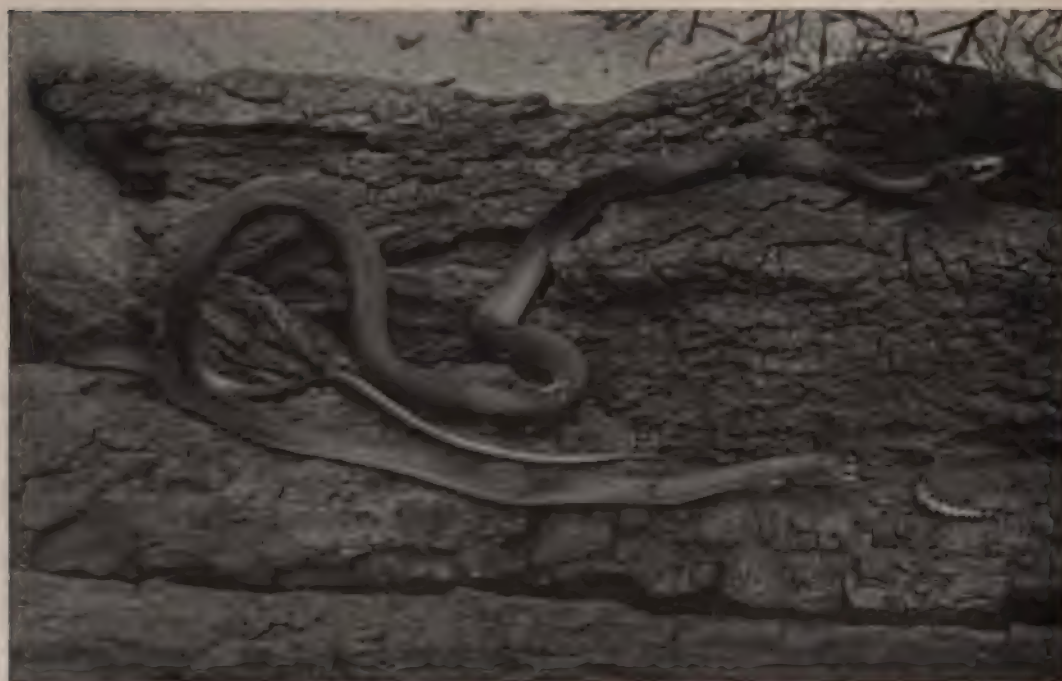


PACIFIC BULL SNAKE, *Pituophis catenifer*
Distinctly different from the two preceding species in the smaller, close-set blotches. Also of smaller size. Common in the southern portion of the Pacific Region. Often called the Gopher Snake



KEELED GREEN SNAKE, *Cyclophis anivus*

A widely distributed, uniform green species. The scales are sharply keeled. Insect larvæ form the principal food



SMOOTH-SCALED GREEN SNAKE, *Liopeltis vernalis*

Widely distributed and distinct from the preceding species owing to the smooth scales. Feeds upon grasshoppers, crickets, spiders, and the larvæ of moths and butterflies

The Bull Snakes

exist to a considerably greater number than with the snakes of the genus already described, are much smaller, and closely succeeding one another. On the sides is a very obscure series of smaller blotches. Beneath, the colour is yellowish, with small and dark blotches at the edges of the abdominal plates.

Variations.—There is considerable variation of the colour of the blotches on the back. These vary from intense black on some specimens, to reddish-brown on others. Young specimens are marked like the parent.

Dimensions.—The Pacific Coast Bull Snake does not appear to attain so great a length as the species inhabiting the prairies. Following are the measurements of an adult specimen:

Total Length.....	4 ft. 7	inches.
Diameter of Body.....	1½	"
Length of Tail.....	9½	"
Width of Head.....	7	"
Length of Head.....	1½	"

Distribution.—The Pacific Coast region, west of the Sierra Nevada Mountains.

Habits.—There is but little variation between the habits of this snake and the other species of the genus. It is fairly hardy as a captive if kept very warm and dry. Judging from observations of a fair series of specimens, this snake is of a less vicious disposition than the other species. When greatly disturbed it hisses loudly and vibrates the tail.

CHAPTER XXXIV : THE GREEN SNAKES

*Representatives of the Genera CYCLOPHIS and LIOPELTIS—
Small Serpents That are of a Uniform, Pale Green Above, and
Thus Characteristic Among North American Snakes*

Two species of small, pale green serpents occur in North America, where both are widely distributed. Owing to their uniform colour—without traces of markings—they are quite distinct and may be immediately recognised. However, to the popular eye, it may appear difficult to separate these species, as one precisely matches the other in colouration of the upper surface. It is by the *scalation* that they may be at once recognised. Although closely related, they belong to different genera. Peculiar to say, both of these snakes appeal to genera that contain a number of Old World species, while the North American species stand as single representatives of their groups in the New World. A simple key for the determination of these snakes is given, and is followed by detailed descriptions of the American species and the genera to which they belong:

Scales keeled; green above; yellowish beneath.

KEELED-SCALED GREEN SNAKE, *Cyclophis æstivus*.

Scales smooth; green above, whitish beneath.

GREEN SNAKE; GRASS SNAKE, *Liopeltis vernalis*.

The Genus *Cyclophis*: A number of species occur in the temperate and tropical regions of Asia. All are of small size and the majority are of a uniform green, yellow or brown above. These reptiles show arboreal habits and are mainly insectivorous. A description of the only North American species follows:

THE KEELED-SCALED GREEN SNAKE; GREEN WHIP SNAKE; MAGNOLIA SNAKE

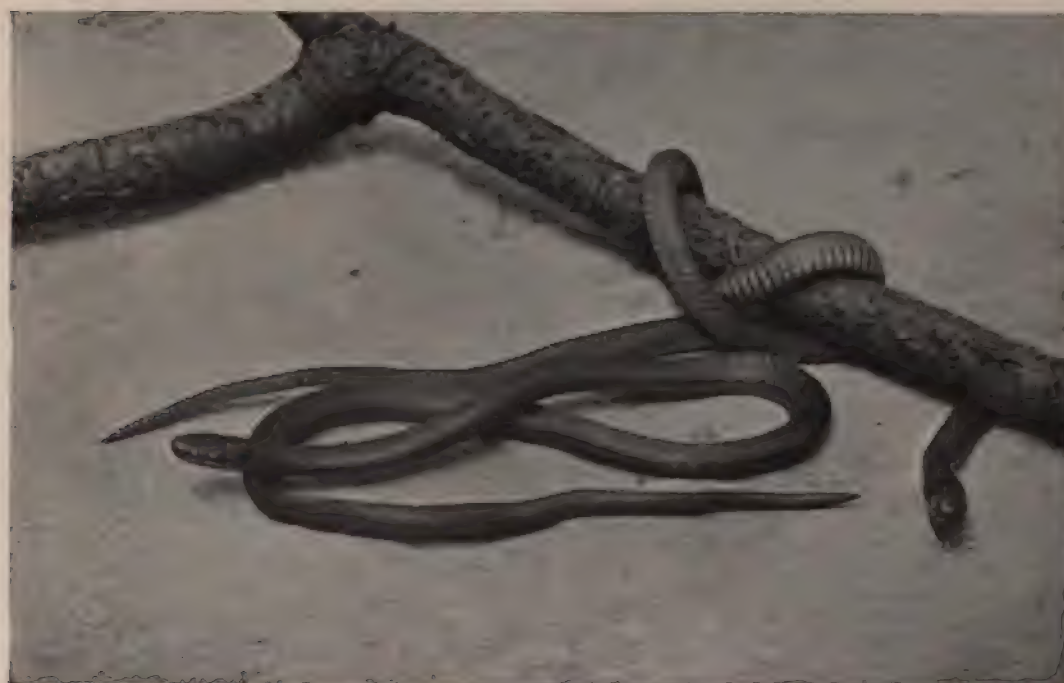
Cyclophis æstivus, (Linn.)

Slender in form, with very long and gradually tapering tail.
The scales are distinctly keeled.



ROCK SNAKE, *Hypsiglena ochrorhynchos*

Diminutive, secretive in habits, and confined to the Southwest. Several allied species are found in Mexico



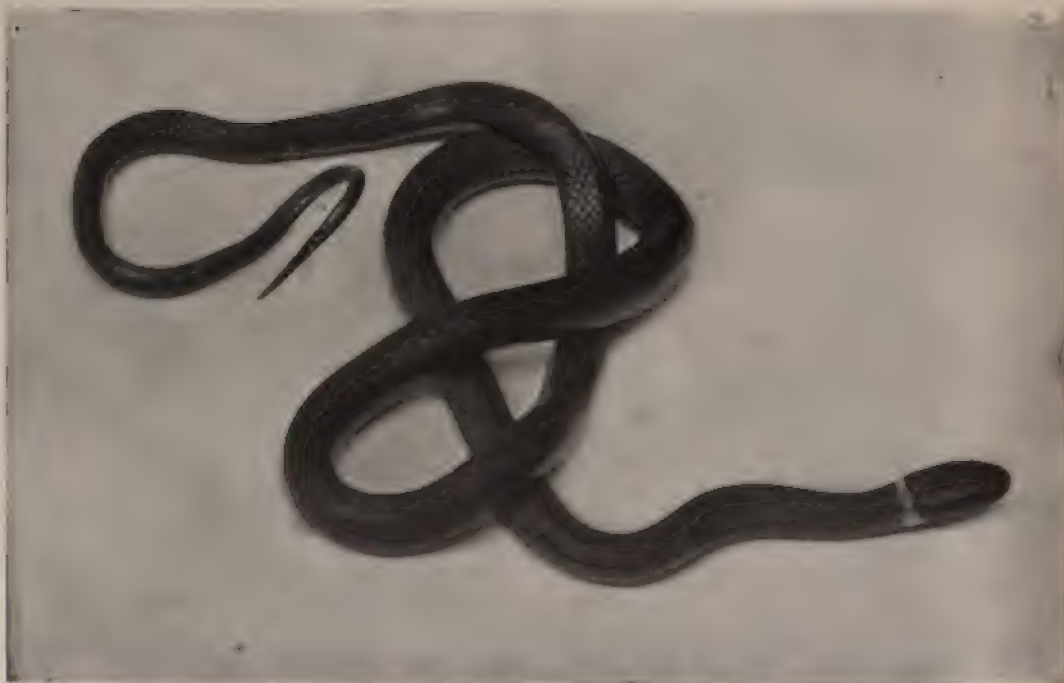
PACIFIC BROWN SNAKE, *Contia mitis*

On most specimens the colour above is dull brown with a rusty red band down the back. The species hides in stone piles or under the bark of decaying trees



EASTERN RING-NECKED SNAKE, *Diadophis punctatus*

In mountainous regions of eastern North America these little snakes are very common, hiding under flat stones or the loose bark of fallen trees



WESTERN RING-NECKED SNAKE, *Diadophis amabilis*

Often coils the tail in a spiral fashion when annoyed. The collar and abdomen may be bright orange yellow or coral red

The Green Snakes

Colouration.—Uniform bright (leaf) green above; beneath bright yellow.*

Dimensions.—The measurements taken are of a fairly large specimen from Gainesville, Florida.

Total Length.	33	inches.
Length of Tail.	12½	"
Greatest Diameter.	1½	"
Width of Head.	¾	"
Length of Head.	¾	"

With specimens from the Eastern and Central States, the tail is from one-third to one-half the total length of the snake. Those from the extreme West have much shorter tails.

Distribution.—Although widely distributed this reptile does not range so far north as the other green snake. Its *habitat* is from southern New Jersey southward through Florida and westward to the Mississippi in the northern portion of its range. In the South, it extends westward to California. It occurs in northern Mexico.

Habits.—The Southern Green Snake is a climbing species, frequenting bushes and low trees. Like the green snake of the North, it is very inoffensive in habits and the greater number of specimens cannot be induced to bite.

This snake is insectivorous, and in captivity will eat grasshoppers and crickets.† Its habits, generally, are much like the smooth-scaled green snake, but it is a more agile climber and in a wild state, more persistently arboreal.

A curious trait of the species is to be constantly observed among the strictly arboreal serpents of the tropics (the whip snakes and allies). This is the habit of protruding the tongue rigidly from the mouth, without spreading the forked tips or rapidly waving that organ as is the custom among snakes generally. While the snake is progressing, the tongue is most frequently protruded in this fashion. As the tongue of this species is of a pale flesh colour, the character may be readily noted.

While hunting snakes in the South, the writer found it most convenient in collecting specimens of this species to shake the

* While the colour of the back matches that of the succeeding species, the abdomen presents a different hue, owing to the decidedly yellowish tinge—that of the allied species being white, or greenish-white.

† Mr. O. Egglings, of New York, tells me that he has induced specimens of this snake to eat mealworms.

The Green Snakes

It is under these flat stones, generally close to the hedges surrounding a meadow, that the eggs may be found. These are considerably more elongated than of the majority of *oviparous* snakes, and are covered with so thin an integument that it is dented upon the slightest pressure of the finger. About a dozen eggs seem to be the maximum number deposited.

On August 14th the writer found four eggs of a Green Snake, on a high ledge, in Sullivan County, New York. The eggs were under a flat stone and had been deposited in a hollow scooped out of the disintegrated lichens and moss, by the female. The stone was very warm, being exposed to the full rays of the sun for the greater part of the day. These eggs were very elongate, and adhesive in pairs. Their covering was so translucent that the dark embryo (nearly ready to hatch) could readily be discerned. The young snakes emerged on the 25th of August. They were $4\frac{1}{8}$ inches in length, very dark olive above and greenish white beneath. About an hour after birth each shed a very thin skin, after which process they were very lively and prowled into every crevice of their cage.

CHAPTER XXXV: SMALL, MISCELLANEOUS SMOOTH-SCALED SERPENTS

The Genera HYP SIGLENA, STILOSOMA, RHADINEA and CONTIA

THE relationship of the genera, of the smaller, smooth-scaled snakes, is problematical. In a few cases we feel fairly assured that we may trace sources of evolution or degeneracy, but if we arrange our series accordingly, the result is at once confusing to the beginner for diminutive reptiles are wedged between large and striking forms. The writer has decided to adopt the most popular method possible; that is to group these smaller snakes, without regard to their alleged relationship. In thus bringing them together, we may arrange the genera in tabulated form, and it is much easier to study the small snakes collectively than to search for them in odd corners through an extensive work. Such genera of the smaller serpents that *have* been scattered through this book, are those that have fallen readily into series with a striking, popular title.

Key to Miscellaneous Genera of Small, Smooth-scaled Serpents

I. *Pupil of Eye Elliptical.*

Body stout; head fairly distinct. Ventral plate divided.
Length 12 to 14 inches. Genus *Hypsiglena*.

Gray or yellow; dark brown blotches on back and two alternating series on sides. A band through each eye to neck; a central band between these. Abdomen white. ROCK SNAKE, *H. ochrorhyncha*.

Distribution.— Texas to California.

II. *Pupil of Eye Round.*

†*Ventral plate entire.*

Body very slender; head not distinct; tail very short.
No *loreal* plate. Snout prominent. Length about 23 inches; tail 2 inches. Genus *Stilosoma*.

Small, Miscellaneous Smooth-scaled Serpents

Silvery gray; 60 to 70 dark brown blotches with blackish borders—interspaces mottled with red; abdomen mottled with black.

SHORT-TAILED SNAKE, *S. extenuatum*.

Distribution.—Florida.

†† *Ventral plate divided*.

Body moderately slender; head fairly distinct; snout blunt. A *loreal* plate. Length about 11 inches.

Genus *Rhadinea*.

* *Scales in 17 rows*.

Uniform reddish-brown; abdomen and lips yellow.

YELLOW LIPPED SNAKE, *R. flavilata*.

Distribution.—North Carolina to Mississippi.

** *Scales in 13 to 15 rows*.

Form rather stout; head not very distinct; a *loreal* plate. Length 10 to 12 inches.

Genus *Contia*.

a. *Scales in 13 rows*.

Pale brown above; abdomen and upper lips white. Tail about one-fifth total length.

TAYLOR'S SNAKE, *C. taylori*.

Distribution.—Duval Co., Texas.

b. *Scales in 15 rows*.

Uniform reddish yellow or gray—scales tipped with light brown. Tail about one-fourth total length.

YELLOW GROUND SNAKE, *C. episcopa*.

Distribution.—Texas; Northern Mexico.

Red or orange, with broad, black cross-bands; snout red, remainder of head black. Abdomen white; tail *ringed* with black.

BANDED GROUND SNAKE, *C. episcopa* variety *isozona*.

Distribution.—Texas to Utah; northern Mexico.

Milk-white, pink or yellow, with narrow black rings—not always complete—about 5 scales apart; a black crescent on head.

RINGED GROUND SNAKE, *C. occipitale*.

Distribution.—Arizona.

Dark brown; a pale stripe on 4th row of scales, bordered below with black dots. A black bar on each temple. Abdomen yellow; plates edged with black. Tail about one-eighth total length.

PACIFIC BROWN SNAKE, *C. mitis*.

Distribution.—Pacific States.

Detailed Descriptions

The Genus *Hypsiglena*: Several species are recognised; one occurs in the United States and northern Mexico; the others inhabit Mexico and Central America. These are stubby little

Small, Miscellaneous Smooth-scaled Serpents

snakes, leading rather a secretive life. The eye is small with a vertical pupil. The rear teeth of the upper jaw are considerably enlarged.

THE ROCK SNAKE

Hypsiglena ochrorhyncha, (Cope)

Size small; body stout; head moderately distinct. One large *preocular* plate, and generally a small one below it (the plates in front of the eye). Scales in 21 rows.

Colouration.—Gray, pale brown or yellow, with a series of irregular, dark brown blotches on the back, very narrowly margined with black; two small, alternating series of blotches on each side.

A dark band through each eye, extending backward to the neck; a central stripe between these bands; the three bands often fuse into a large, dark blotch situated a short distance behind the head. Top of head and lip plates, dotted with brown. Abdomen white.

<i>Dimensions</i> .—Total Length	15 $\frac{3}{4}$ inches
Length of Tail	3 $\frac{1}{8}$ "
Greatest Diameter	$\frac{3}{8}$ "
Width of Head	$\frac{5}{16}$ "
Length of Head	$\frac{9}{16}$ "

Distribution.—Western Texas to southern California; Lower California and northern Mexico.

Habits.—Probably nocturnal, owing to the elliptical pupil. A small swift (*Sceloporus*) was found in the stomach of an alcoholic specimen; the eggs of some small lizard or snake were taken from the stomach of another.

The Genus *Stilosoma*: One species known; it inhabits Florida. Body very slender. Teeth of the upper jaw of about uniform size. Ventral plate entire.

THE SHORT-TAILED SNAKE

Stilosoma extenuatum, (A. E. Brown)

Form very slender; tail very short. Head not distinct from the neck; snout prominent. Scales in 19 rows.

Colouration.—"Body colour silvery gray, with 60 to 70 irregular, dark brown dorsal spots with blackish border on the body,

Small, Miscellaneous Smooth-scaled Serpents

and about twelve on the tail; on the dorsal line the interspaces are mottled with pale red; belly blotched with black which extends on the sides and often breaks into the lateral spots; on the sides the scales are finely punctulated with black; a dark patch on the parietals, with a smaller one on each side of the neck; a dark, post-ocular streak; forepart of head, chin and throat maculated with black." (A. E. Brown).

Dimensions.—Total length 23 inches; tail, 2 inches.

Distribution.—This rare snake is known only from Marion and Orange Counties, Florida.

Habits.—Apparently a burrowing species.

The Genus *Rhadinea*: The several species inhabit North and South America; but one is found in the former. All are of small size. Rear teeth of the upper jaw slightly enlarged, but smooth. A *loreal* plate and one *preocular*; ventral plate divided.

THE YELLOW-LIPPED SNAKE

Rhadinea flavilata, (Cope)

Body moderately slender; head fairly distinct; scales smooth and polished. Tail proportionately long. Scales in 17 rows.

Colouration.—Pale reddish-brown above—paler on the sides, which are of a golden tinge. Head darker than the body. A dusky band commences behind the snout, extends to the eye, thence from behind the eye to the angle of the mouth. The upper lip is bright yellow; abdomen immaculate yellow.

**Dimensions*.—Total Length.....12 inches.
Length of Tail..... $3\frac{1}{2}$ "
Greatest Diameter..... $\frac{1}{2}$ "
Width of Head..... $\frac{1}{2}$ "
Length of Head..... $\frac{1}{2}$ "

Distribution.—A rare species. Occurs from the Atlantic Coast region—North Carolina to Florida—westward to Mississippi.

Habits.—Little is known of this snake. It is a secretive reptile and may be found under the bark of decaying logs.

The Genus *Contia*: A number of small snakes are embraced in this genus; some inhabit Asia; four are found in the United

*Through the courtesy of Dr. Samuel Garman and Mr. Thomas Barbour the writer was able to photograph the head and obtain measurements of this rare snake.

Small, Miscellaneous Smooth-scaled Serpents

States and these are prettily coloured reptiles. With the exception of one species—*C. mitis*, these snakes have a groove on the rear tooth in the upper jaw. Further investigation of this structure may show them to be related to the *Opisthoglyph* snakes, but as the groove is very shallow and the presence of attendant glands has not been determined, we will include them, provisionally, among those colubrine serpents that are devoid of a specific secretion to be used in overpowering the prey and specially constructed teeth to inject it.

Scales perfectly smooth, with a satiny lustre, in 13 to 15 rows—with the American species. A *loreal* plate; one *preocular* plate; ventral plate divided.

TAYLOR'S SNAKE

Contia taylori, (Boulenger)

Body moderately stout; tail about one-fifth the total length. Scales in 13 rows.

Colouration.—Pale brown above, each scale darkest along the centre; abdomen and upper lip white.

Dimensions.—Total length, 10 $\frac{3}{8}$ inches; tail, 2 $\frac{1}{8}$ inches.

Distribution.—Duval County, Texas; northern Mexico. Three specimens known.

YELLOW GROUND SNAKE

Contia episcopa, (Kennicott)

Scales in 15 rows. Tail about one-fourth the total length.

Colouration.—"Yellowish, reddish or greenish, sometimes with a yellow dorsal stripe three scales wide; most of the scales tipped with light brown; top of the head like the body, or brown, or black; belly yellowish or greenish white." (A. E. Brown.)

Dimensions.—Total length, 10 inches; tail 2 $\frac{1}{2}$ inches.

Distribution.—Texas and northern Mexico.

BANDED GROUND SNAKE

Contia episcopa, variety *isozona*, (Cope)

Proportions like the typical form.

Colouration.—A handsome little snake. Red or deep orange above, with black cross-bands, extending downward nearly to the abdominal plates; head black with exception of the snout,

Small, Miscellaneous Smooth-scaled Serpents

which is red or orange. Abdomen white; on the tail the black markings form complete rings.

Distribution.—Texas to Arizona; northward to Utah; southward into Sonora, Mexico.

RINGED GROUND SNAKE

Contia occipitale, (Hallowell)

Snout most prominent of any of the species. Scales in 15 rows. Tail about one-fifth the total length.

Colouration.—Milk-white, pink or yellow, with narrow black rings around the body—sometimes broken at the edges of the abdominal plates—separated by intervals of about five scales; between the rings, the abdomen is white.

A black crescent on the rear part of the head, the points directed forward.

Dimensions.—Total length 12 inches.

Distribution.—Arizona.

PACIFIC GROUND SNAKE; BROWN SNAKE

Contia mitis, (Baird & Girard)

Largest of the North American species, reaching a length of 16 inches. Body rather stout; tail very short; head flat, blunt at the snout and not distinct from the neck.

Colouration.—Dark chestnut-brown above, with a reddish-brown band on each side of the back—these bands are very obscure on some specimens; they are situated on the fourth row of scales and often margined beneath by black dots. A black streak on each side of the head, from the eye to angle of the mouth. Abdominal plates yellow, broadly margined with black.

Dimensions.—Following are the measurements of a small adult:

Total Length.	11 $\frac{1}{2}$ inches.
Length of Tail.	2 $\frac{3}{8}$ "
Greatest Diameter.	$\frac{1}{4}$ "
Width of Head.	1 $\frac{3}{8}$ "
Length of Head.	$\frac{3}{8}$ "

Distribution.—The Pacific region, from Washington (inclusive) to California (inclusive).

CHAPTER XXXVI: THE RING-NECKED SNAKES

GENUS DIADOPHIS

Small, Smooth-scaled Serpents with Characteristic Markings

THE genus *Diadophis* is composed of four, small species. Three inhabit the United States and Mexico; one species occurs on the island of New Providence, in the Bahamas.

The North American species are characteristic in their peculiar colouration—a bright yellow ring about the neck and in bold contrast to the sombre body-colour, either uniform dark gray or brown. These snakes are of rather slender build. The scales are smooth and glossy. All are of small size and secretive habits.

As is usually the case with small serpents, the colouration and conformation of the species are quite similar and it is impossible to present strictly popular descriptions that would be of value in actual identification. Thus it is necessary to count the rows of scales and the plates of the abdomen, to properly separate the species. Locality alone, however, will in many instances determine the name of a specimen; hence in the following key, the distribution of each species is given.

Key to the Ring-necked Snakes

- a. A bright yellow ring on neck. Body uniform gray or brown.

**Fifteen rows of scales.*

160, or a lesser number of abdominal plates. Gray or brown above; yellow beneath.

EASTERN RING-NECKED SNAKE, *D. punctatus*.

Distribution.—U. S. east of the Mississippi; Canada.

210, or a lesser number of abdominal plates. Brown or gray above; yellow or red beneath.

WESTERN RING-NECKED SNAKE, *D. amabilis*.

Distribution.—Western States and the Pacific region.

- b. Yellow collar obscure or absent.

***Seventeen rows of scales.*

The Ring-necked Snakes

Dark gray or blackish; yellow or red beneath.

SONORAN RING-NECKED SNAKE, *D. regalis*.

Distribution.—Central region—Ohio to Colorado; southward into Mexico.

Several varieties are worthy of notice and will be treated in the detailed descriptions that follow:

THE EASTERN RING-NECKED SNAKE

Diadophis punctatus, (Linn.)

The body is moderately slender and the head quite flat, though not very distinct from the neck. The scales are in fifteen oblique rows and the plates of the abdomen—not including those under the tail—exist to a number of 140 to 160. An adult specimen is about fourteen inches long.

Colouration.—Dark gray above, with a ring of bright yellow around the neck, immediately behind the head. The abdomen is orange yellow and the intersection of the gray of the upper surface with the pale hue beneath occurs at the edges of the abdominal plates; the gray extends in wedge-shaped fashion over the edge of each plate, producing a sharply serrated border of the colour.

There is often a single row of black spots on the centre of the abdomen.

Very young specimens are blackish rather than gray and the yellow half-collar is vividly defined. A half-grown specimen from Marion County, Florida, is rather unique in colouring. Above, it is jet-black with a narrow ring of coral red, broken at the top of the neck. The abdomen is deep yellow, with a row of large, black spots in the centre; *the underside of the tail is brilliant, coral red*.

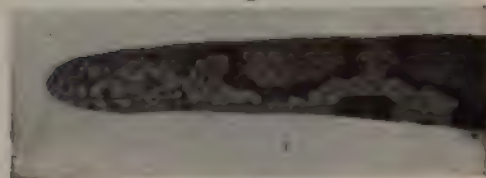
Dimensions.—A mature specimen, taken in Sullivan County, New York, shows the following, *average* measurements:

Total Length.....	13 inches.
Length of Tail.....	2 $\frac{7}{8}$ "
Greatest Diameter.....	1 $\frac{5}{8}$ "
Width of Head.....	1 $\frac{5}{8}$ "

The largest specimen examined by the writer was taken at Forestine, Sullivan County, New York. Its measurements are given:



3



4



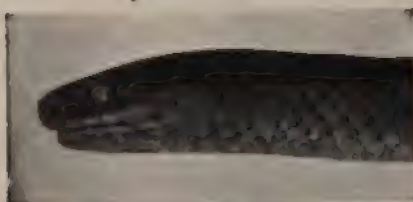
5



6



7



8



9



10



11



12

1, 3 Milk Snake, *Ophibolus deliatus triangulus*. N. Y.
2, 4 Red Milk Snake, *O. d. clericus*. Va.
5, 8 Brown King Snake, *O. rhombomaculatus*. Va.

11, 12 Common King Snake, *O. getulus*. Fla.
9 Boyle's King Snake, *O. getulus boylii*. Cal.
6, 7, 10 Arizona King Snake, *O. zonatus*. Ariz.



BROWN KING SNAKE, *Ophibolus rhombomaculatus*. Young Adult
The young look much like the adults of a more westerly species, *O. calligaster*



BROWN KING SNAKE, *Ophibolus rhombomaculatus*. Old Example
Adult examples are a rich, golden brown, with obscure, darker brown blotches. The food consists mostly of small birds and rodents

The Ring-necked Snakes

Total Length.....	19½ inches.
Length of Tail.....	3½ "
Greatest Diameter.....	1⅞ "
Width of Head.....	1⅞ "
Length of Head.....	¾ "

The latter specimen was rather light gray above, with a dull yellow collar; the abdomen was pale yellow, with no trace of black spots.

Distribution.—Generally distributed in North America, east of the Mississippi River, from southern Canada (inclusive) to Florida (inclusive).

Habits.—The Ring-necked Snake is a secretive species, hiding under the loose, rotting bark of fallen trees, among loose rocks or under flat stones. It is seldom seen abroad and if it ventures from its lairs, usually prowls at night. In the North, the writer has collected large numbers of these pretty snakes by turning over flat stones. He remembers a particular stone, about the size of an ordinary platter, lying near the edge of heavy timber, in Sullivan County, New York, that appeared to be a favourite hiding place for snakes of this species. In his daily trips to the woods, this stone was always turned over, and generally to disclose a Ring-necked Snake, snugly coiled beneath it. Many specimens were taken at this spot. They had apparently prowled about the clearing at night and on their way back to the thicket, and its hiding places, had discovered the shelving stone.

In the South, large numbers of these reptiles were collected by stripping the bark from fallen trees. To find fifty or more specimens during a half-day's hunt for various reptiles that select such hiding places, was not unusual. The Ring-necked Snakes were most frequently found under the bark of trees infested by ants; often the working streams of these insects would pass but a fraction of an inch from the spot where the reptile lay coiled. In one instance, while pursuing some entomological investigations during the early spring, the writer exhumed one of these snakes while digging through a large and thickly populated ant-hill.

This species is quite omnivorous. It feeds largely upon earthworms and the smaller species of salamanders, as well as lizards and snakes. The writer has observed numerous speci-

The Ring-necked Snakes

mens in the act of swallowing half-grown green snakes,* and adults of the red-bellied snake.†

Although the species is *oviparous*, it appears to be one of those serpents that stand midway between the *viviparous* and the egg-laying snakes, as the eggs contain large embryos when deposited and hatch in less than half the time required for the development of the eggs of the majority of snakes. The eggs are very elongate and covered with a very thin integument. After deposit they increase rapidly in size, acquiring curious and irregular outlines, which in some instances may be curved, like a boomerang. (Illustration—3 eggs).

The writer believes the following to be the first authentic notes published concerning observations on the development of the eggs of this species. The female snake had been received a month previous, from Sullivan County, New York:

- June 28th. Three elongate eggs deposited. These are $1\frac{1}{8}$ inches in length, and $\frac{3}{8}$ of an inch in diameter at the thickest part. The female snake is 15 inches in length. Damp wood pulp was selected as a hatching medium for the eggs.
- July 25th. The eggs have increased in size to a great extent and now measure $1\frac{3}{8}$ inches in length, and $\frac{1}{2}$ an inch in diameter at their thickest part.
- Aug. 8th. All of the eggs have hatched. Just prior to hatching they measured $1\frac{1}{2}$ inches in length and $\frac{1}{2}$ an inch in diameter. *The young snakes are surprisingly large—4 $\frac{1}{8}$ inches long; the ground colour is darker than the parent—almost black—while the ring around the neck is pale, yellowish-white.*

From the dates given, it will be appreciated that the development of these eggs was *very rapid*. A batch of eggs of the coral snake, deposited about the same time, contained embryos but half-way developed, when the Ring-necked Snakes had left their membraneous shells.

That the breeding habits of this species may vary—and occasional females actually produce living young—seems very probable after the receipt of a letter from Arthur Erwin Brown, Director of the Zoölogical Gardens in Philadelphia. Mr. Brown

* *Liopeltis vernalis*.

† *Storeria occipitomaculata*.

The Ring-necked Snakes

is a painstaking observer of reptiles; an extract of his letter follows:

"In August, 1891, two small *Diadophis punctatus*, evidently newly born, appeared in a case containing several adults. No indication of eggs had been observed, nor were any fragments of egg membranes found when the young were first seen. The apparently near relationship of *Diadophis* to *Ophibolus* and *Coronella*—both egg-laying genera—makes me rather cautious about believing that *Diadophis* is *viviparous* in a state of nature, and it may be that the conditions of captivity accelerated the development of the young and that they were *ovo-viviparously* produced. That is the only time they have bred here."

THE WESTERN RING-NECKED SNAKE

Diadophis amabilis, (B. & G.)

This pretty species is considerably more slender than the preceding. It has a greater number of abdominal plates—from 180 to 210.

Colouration.—The colouration of the typical form is much like that of the preceding species, except that the black spots on the abdomen are irregularly distributed instead of in a straight row as seen with the allied species.

The variety *pulchellus*—the Pacific Ring-necked Snake: From the typical form this variety differs in the distinctly greenish (sometimes bluish) ground-colour, the reddish collar and the coral red hue of the abdomen. It inhabits Oregon and California.

<i>Dimensions;</i>	Total Length.	17	inches.
	Length of Tail.	3 $\frac{5}{8}$	"
	Greatest Diameter.	$\frac{1}{4}$	"
	Width of Head.	$\frac{1}{4}$	"
	Length of Head.	$\frac{7}{16}$	"

Distribution.—Texas, westward to the Pacific Coast; northward to Washington. Sonora, Mexico.

Habits.—From the actions of captive specimens it seems that this little snake at times employs constriction to overpower its prey—small, burrowing snakes, salamanders and earthworms. It has a curious habit, when annoyed, of elevating and twisting its tail in corkscrew fashion, displaying both the dark ground-colour and the bright red of the underside and producing a peculiar effect. The tail is often reared two inches or more from the coil. The habit is demonstrated in the photograph.

The Ring-necked Snakes

THE SONORAN RING-NECKED SNAKE

Diadophis punctatus. (B. & G.)

From the other species of ring-necked snakes, this serpent may be told by the greater number of scale-rows and abdominal plates. The scales are in seventeen rows; the abdominal plates exist to the number of 183 to 237 (A. E. Brown). It is the largest species of the genus, attaining a length of two feet.

Colouration.—The typical form is dark bluish-gray above, the abdomen yellow or reddish, with numerous, small, black spots; the pale hue of the abdomen extends upward over the first row of scales. On some specimens there are traces of a yellowish or reddish collar; on the greater number this is absent.

The variety *arnyi* is brownish-black, which dark hue extends downward to the edges of the abdominal plates.

Dimensions.—The length of an adult specimen is from twenty to twenty-four inches.

Distribution.—The Central and Western States—Illinois southward to Arizona and thence to Vera Cruz. In the Central region the species has been taken in the states of Illinois, Iowa, Kansas and Missouri. It occurs in Colorado in the West.



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MILK SNAKE. *Ophibolus doliaatus triangulus*. New York.
This variety shows the blotches to extend but a moderate distance down the sides.



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SOUTHERN MILK SNAKE. *Ophibolus doliaatus clericus*. Maryland.
Examined from directly above the serpent appears ringed owing to the blotches nearly reaching the abdomen.



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SCARLET KING SNAKE. *Ophibolus doliaatus occiduus*. Florida.
An extreme variation of *O. doliaatus*. It is completely ringed with the bright colours and breeds like the poisonous *Ela*ps.

CHAPTER XXXVII: THE KING SNAKES

GENUS OPHIBOLUS

Smooth-scaled Constricting Serpents of Small, Medium and Large Size, which Derive the Popular Title From Their Habit of Killing and Eating Both Harmless and Venomous Snakes

THE species comprising the genus *Ophibolus* are among the most interesting of the North American serpents. They range in size from fourteen inches to six feet in length, are of moderately stout proportions, possess smooth scales—highly polished with the greater number—and a rather small head, which is but slightly distinct from the neck. The colouration is arranged in transverse bands or rings and is of striking hues. These snakes inhabit the United States, Mexico and Central America. In the Old World they are represented by their near allies—the snakes of the genus *Coronella*.

Although all of the King Snakes are powerful constrictors and feed largely upon small rodents, they evince a marked inclination toward cannibalism and prey frequently upon snakes other than their own species—among these the poisonous serpents. In their combats with the latter they are often bitten, but appear to be quite immune to the action of snake poison.

To the agriculturist, the King Snakes are of considerable economic importance, as their strong, cylindrical bodies, provided for a semi-underground existence, enable them to work their way into the burrows of the injurious creatures of the fields in the reptiles' search for food. Moreover they destroy both the young and adults of the venomous snakes. However, the King Snakes are not, as is generally alleged, the sworn enemies of the dangerous serpents. They are quite as relentless in constricting and eating a harmless snake as a poisonous one. In their attitude toward man the various species are among the most mild-tempered and inoffensive of snakes. They are very hardy in captivity and will live for years.

Seven species of this genus occur in the United States—one

The King Snakes

extending slightly over the southwestern border, from Mexico. With the exception of one other species and its several varieties (inhabiting Mexico and Central America) this number represents the entire genus. Several of the species exhibit bewildering variations of the pattern—in fact, some of the varieties have attained such distinction in *form* and *size* as well as their differences in colouration from the typical reptile, that the writer feels none too sure he is correct in describing them as subspecies. Among them, however, we may trace a chain of characters, one appealing to another. Thus it appears best to regard them provisionally as varieties. They form an admirable example of the march of evolution, where the extension of *habitat* has brought about different climatic conditions, inducing a change of habits; with this change, the pattern is gradually altered and Time points to the formation of a distinct species.

Following is a key to the King Snakes, embracing both the typical forms and their varieties:*

Key to the King Snakes

- I. Pattern: Alternating half-rings of black, and red (black-bordered) on gray ground.
Gray, with half rings of red (black-bordered), in alternation with narrow half-rings of black.
Beneath blotched with black.
DAVIS MOUNTAIN KING SNAKE, *O. alternus*.
Distribution.—One specimen known—from western Texas.
- II. Pattern: Red, yellow and black, in rings.
Red rings very wide; black rings about a quarter the width of the former and containing a very narrow and indistinct ring of yellow.
MEXICAN RINGED SNAKE, *O. micropholis*.
Distribution.—This phase of a Mexican species occurs in the extreme southern portion of Arizona, southwestern Texas and northern Mexico.
Red rings of moderate width; yellow rings about half the width of the former and bordered by narrower rings of black.
ARIZONA RINGED SNAKE, *O. zonatus*.
Distribution.—Arizona and southern California.
Similar to the former on forward portion of body; on latter portion the black rings widen, obscuring the red—this character usually most pronounced on abdomen.
WESTERN MILK SNAKE; RED KING SNAKE; RINGED KING SNAKE, [*O. dolius gentilis*].
Distribution.—Nebraska and Louisiana to S. W. Texas; northern Mexico.

* Although the keys to the greater number of genera have not been arranged in this fashion, the writer has considered it best to thus treat this genus, owing to the striking variations in pattern as well as in colours.



RINGED SNAKE, *Ophibolus doliaius gentilis*. From Nebraska
A western variety of *O. doliaius*, on which the black and yellow encircle the body



MEXICAN RINGED SNAKE, *Ophibolus micropholis*
Closely allied to *O. doliaius*. Feeds upon snakes and lizards and is strikingly like the Mexican Coral Snake—*Elaps*



ARIZONA KING SNAKE; RINGED SNAKE, *Ophibolus conatus*. From Arizona
Two distinct phases inhabit Arizona and California, respectively. The colours are scarlet, yellow, and black, arranged in rings.
On the Arizona phase, the black predominates



ARIZONA RINGED SNAKE; KING SNAKE, *Ophibolus conatus*. Southern California
The California phase is regularly ringed and the most beautiful snake found in the extreme West



SAY'S KING SNAKE, *Ophibolus getulus sayi*
Found in the lower portion of the Mississippi Valley and is remarkable in having a bright green spot in the centre of each scale

The King Snakes

Red rings widest; yellow rings bordered by equal-sized rings of black. This is much the smaller of the ringed King Snakes.

SCARLET KING SNAKE; "CORAL SNAKE," *O. fasciatus coccineus*.

Distribution.—North Carolina to Florida; westward to the Mississippi.

III. Pattern: Red or brownish blotches on a pale ground.

a. Blotches wide.

Yellowish, with red (black-bordered) blotches extending to the first row of scales.

SOUTHERN MILK SNAKE, *O. d. liatus* (typical).

Distribution.—Maryland to Florida; westward to Texas.

Yellow or gray, with red or brown (black-bordered), blotches reaching the third row of scales; small, alternating blotches on sides.

RED MILK SNAKE, *O. d. liatus clericus*.

Distribution.—Southern New Jersey to North Carolina; westward to Illinois.

Yellow or gray, with brownish (black-bordered) blotches reaching to about fifth row of scales; smaller blotches on sides.

MILK SNAKE; HOUSE SNAKE, *O. d. liatus triangulus*.

Distribution.—The New England States to North Carolina; westward to Wisconsin.

b. Blotches small and oblong.

Pale brown, with darker brown blotches on back and a smaller series on sides. No bands on top of head.

BROWN KING SNAKE, *O. rhombomaculatus*.

Distribution.—Maryland to South Carolina; westward to the Allegheny Mountains.

Brownish-gray, with dark brown blotches (black-bordered) on back and smaller blotches on sides; usually a band across, and lengthwise on top of head.

YELLOW-BELLIED KING SNAKE, *O. calligaster*.

Distribution.—Minnesota to northern Texas; eastward to Indiana and westward to Kansas.

IV. Pattern: Pale and narrow transverse bands on a darker ground.

Black, brown or green, with yellow or white transverse bands which fork and join one another on side in chain-like fashion.

CHAIN SNAKE; COMMON KING SNAKE, *O. getulus*.

Distribution.—Southern New Jersey to Florida; westward to Louisiana.

Black or brown with white or yellow transverse bands which widen on sides.

BOYLE'S KING SNAKE, *O. getulus boylei*.

Distribution.—California, Arizona and Nevada.

Appeals to the former, but many of the rings are broken and interspersed with short stripes.

CALIFORNIA KING SNAKE, *O. getulus californica*.

Distribution.—Southern California; Lower California

V. Pattern: A pale spot in the centre of each scale.

Black, with a yellow, green or white spot in the centre of each scale.

SAY'S KING SNAKE, *O. getulus sayi*.

Distribution.—Southern Illinois through the southern plains region, and south to Louisiana and western Texas

As has hitherto been the custom in this work, the arrangement of species in the key has been guided solely by the idea to group them in a fashion that may be used in hasty identification—not from the standpoint of technical classification. This has been the case with the King Snakes, as their peculiar patterns

The King Snakes

may be readily divided in the construction of a popular key, though the division throws the species out of scientific order in their *structural* relationship to one another. *In the following descriptive list the species are arranged in scientific order*, and the sub-species or varieties precede or follow the typical form, according to the trend of their variation.

THE MILK SNAKE; HOUSE SNAKE; "CHECKERED ADDER"

Ophibolus doliatus variety *triangulus*, (Daudin)

This is the largest of the varieties of *O. doliatus*—the Southern Milk Snake—and the most distinct from it in pattern as a *spotted* snake. It attains a length of about a yard, is moderately slender, cylindrical in shape, and possesses a small head which is but little distinct from the neck. The scales are perfectly smooth, of a satiny lustre, and in 21 rows.

Colouration.—Gray above, with a series of large, chestnut-brown or olive-brown saddles on the back, these narrowly bordered with black. *The blotches extend down the sides to about the fifth row of scales* (above the abdominal plates). In alternation with the blotches on the back, is a series of smaller blotches on the side.

The first of the series of central blotches—this covering the head and a portion of the neck, is elongated and encloses a triangular patch of the pale ground-colour, the point directed toward the body; the base of this triangle is niched by the dark colour of the blotch, on many specimens, imparting a forked outline to that part of the triangle directed toward the head. A narrow band extends from behind the eye to the angle of the mouth.

The abdomen is white, marked boldly and irregularly with square black spots and blotches.

Colouration of the young.—A newly hatched specimen shows the same pattern as the parent, but the blotches on the back and the sides are distinctly reddish, and bordered with jet-black.

Half-grown specimens usually possess rich crimson blotches and at this stage resemble in their colours the more Southern Milk Snake—the variety *clericus*—from which they may be distinguished by the shape of the pale patch of ground-colour

The King Snakes

within the first blotch of the upper series and the generally narrower character of the blotches.

Dimensions.—The common Milk Snake attains a length of three and a half feet, but such dimensions are above the average, which is given:

Total Length.	34	inches.
Length of Tail	5	"
Greatest Diameter.	$\frac{5}{8}$	"
Width of Head.	$\frac{5}{8}$	"
Length of Head.	1	"

Distribution.—The southern New England States southward to North Carolina and westward to Illinois and Wisconsin. This serpent is particularly abundant in the counties of Ulster, Green, Delaware and Sullivan, of New York State.

Habits of the Milk Snake

From the habit of prowling about the vicinity of stables and dairies (in search of mice and rats), this prettily coloured snake has acquired the bad reputation of stealing milk from the cows, and making inroads upon the farmer's product to such an extent that he may actually suffer financial loss from the depredations committed by one of these reptiles. This is one of the many fallacies existing about snakes, and resulting in an unjust slaughter of really useful creatures. Snakes show no liking for milk. Captive specimens cannot be induced to drink it unless suffering from great thirst. It would be a feat beyond physical possibility for a serpent the size of the largest Milk Snake to consume enough milk from a cow—if the reptile should be so inclined—to produce an effect noticeable to the most minute degree. When mature, this snake attains a length of about a yard, and is of rather slender build. A serpent of this size could consume, if drinking its full of water, a quantity equivalent to about two teaspoonsful; this would demonstrate its capacity for milk, and any cow that fed upon the scantiest vegetation that ever graced sterile soil should yield enough milk to allow for this quantity to be lost without being noted by the dairyman. Incidentally it might be explained that the Milk Snake frequents country where the grazing is good and the cattle yield much milk. In the face of these circumstances the reader is asked to ponder on the logic of the farmer who declares that a single

King Snakes

"Milk" Snake can steal enough milk from one of his cows to produce a marked deficiency to be noted at milking time.

The Milk Snake is a rather secretive species, hiding under flat stones or débris and preferring to prowl late in the day or at twilight than during the brightest hours of light. It is particularly fond of small rodents, and feeds largely upon mice and young rats. Like all the snakes of the genus *Ophibolus*, its habits incline toward cannibalism, and it feeds frequently upon the young of other snakes, besides such lizards as the "blue-tail" and the swift, which it hunts at night as these creatures take refuge in the crevices of bark on fallen trees. The writer dissected a specimen that had been killed in a barn, in Sullivan County, N. Y. The stomach contained five very young rats. Confronted by this demonstration of the reptile's useful habits, the man who had killed the snake stubbornly remarked that "a snake is a snake" and refused further argument.

In captivity this snake is indifferent in feeding and seldom lives long. It prefers mice, which are quickly constricted to death in the reptile's strong coils. Young specimens can seldom be induced to take food of any character. Although rather a quiet reptile, the Milk Snake will sometimes resent handling in a curious and rather treacherous manner. Without a pretence of striking it will swing the head about suddenly and grasp the hand, when it deliberately *chews* in such a manner that the fine, recurved teeth lacerate the flesh sufficiently to bring the blood, although the minute punctures are but very superficial wounds and heal at once, like a scratch from a pin point.

The breeding habits of this species represents those of the typical *oviparous*—egg-laying—snakes. From the notes that follow these characters are well illustrated.

A specimen taken near Englewood, New Jersey, and measuring 31 inches in length, deposited eight eggs, on the 10th of July. The eggs were oval, with a leathery shell, and presented the same soft and white external appearance as the surface of a toadstool. This batch of eggs was placed in damp wood-pulp. At regular intervals one was taken from the lot and opened, in order to observe the growth of the embryos. During the process of incubation care was taken to keep the eggs from "drowning"—absorbing too much moisture. They solidify if kept too damp. A list of the results is given:

The King Snakes

- July 10th. Eggs deposited. Symmetrically oval in shape; *length, $1\frac{1}{8}$ inches—diameter, $\frac{1}{2}$ an inch.* On opening one of these eggs it was found to contain a tightly coiled *embryo, two inches long*, with well-developed head and eyes well discernible.
- July 19th. The eggs are irregular and lumpy in outline. *Length, $1\frac{1}{4}$ inches—greatest diameter, $\frac{1}{2}$ of an inch.* One opened; contained *embryo $3\frac{1}{2}$ inches long*. When the same is closely examined the formation of the scales can be plainly seen. The specimen is translucent and when held against the light the heart may be seen beating in lively fashion.
- Aug. 6th. Another of the eggs opened; it contains an *embryo $4\frac{3}{8}$ inches long*, and much less translucent than that of the preceding observation. The scalation is well formed, but no pattern is apparent.
- Sept. 4th. The remaining eggs about to hatch. The young snakes have cut openings in the shells and occasionally protrude the tip of the snout for air.
- Sept. 5th. All of the young snakes have emerged. *They are $7\frac{1}{2}$ inches in length, and $\frac{3}{8}$ of an inch in diameter at the thickest part of the body.* In pattern they are like the adult, though the blotches on the back are of a more reddish tinge. About three hours after hatching they shed their skins. At the time of hatching the eggs are nearly twice the size than when laid.

Another specimen deposited eleven eggs on the 12th of July, which were adherent in a cluster. This female was found coiled about the eggs—thus gathering them tightly together. The same habit was observed with several specimens. The brood in question hatched between September 6th and 8th. (Illustration, female and eggs.

A fine specimen taken but a week previously near Ft. Lee, New Jersey, laid nine eggs on July 28th. This female remained coiled about the cluster for twenty-four hours. The young snakes emerged on October 1st, 2d, and 3d.

The writer has examined a remarkable two-headed individual of this species, which creature fed upon very young mice. However, the two heads had energetic quarrels for priority in swallowing, although both throats led to a single channel connecting with one stomach. In progressing there was a tendency for the two heads to disagree, and locomotion was slow and erratic.

The King Snakes

The movements of the heads were entirely independent of each other. While one would be gazing about, with quivering tongue, the other might be quiescent. This unique reptile lived for about a year, actually growing to about two-thirds the length of an adult specimen.

THE RED MILK SNAKE

Ophibolus doliatus variety *clericus*, (B. & G.)

Smaller than the preceding serpent and more closely resembling the typical form, owing to the wider blotches and the paler ground-colour, imparting more the appearance of being ringed above with scarlet and yellow than blotched or spotted like the variety *triangulus*—the Northern Milk Snake.

Colouration.—Yellowish above, with a series of large, deep scarlet, transverse blotches, narrowly bordered with black, which vary in their extension to the third, second or first rows of scales—the majority reaching the two latter rows. With some specimens the blotches are chestnut brown. There is a row of smaller, alternating blotches on the sides, widely margined with black which so fuses over many of them as to nearly obliterate the red.

The head is mostly red above, with a small, light spot above each eye. Immediately behind the head and preceding the first of the regular blotches is a circular spot of the ground-colour, ringed with black; this takes the place of the triangular patch of light colour on the neck of the Northern form—*triangulus*, and is a useful character to be considered in distinguishing the present variety.

The abdomen is white, boldly tessellated with black.

Examined from above, this variety looks like a red snake, marked with narrow rings of yellow or pale gray—the latter bordered with narrower rings of black. From the side, the large blotches will be seen to be wider than with the variety *triangulus*—extending much nearer the edges of the abdominal plates.

Dimensions.—An adult specimen from Washington, D. C., shows the following measurements:

Total Length.....	19	inches.
Length of Tail.....	2 $\frac{1}{2}$	"
Diameter of Body.....	1 $\frac{7}{8}$	"
Width of Head.....	$\frac{3}{8}$	"
Length of Head.....	$\frac{5}{8}$	"

Distribution.—It appears that this variety takes the place of *triangulus* in the southern portion of the latter's range and thus forming the connecting link in the distribution of varieties with the typical form—a Southern reptile. The range of the Red Milk Snake extends some distance northward into that of the Northern form and they intermingle from southern New Jersey westward to the Mississippi. The present form extends southward to Georgia.

Variations.—The sub-species under consideration is itself subject to some variation of pattern—although the differences are but superficial. On certain specimens, the first light patch of colour behind the head extends as a half ring around the neck instead of being confined to a circular area above. From a specimen showing this slight variation was based the variety "*collaris*." Sometimes the light patch of colour extends forward to the temples—a character eliciting the name "*temporalis*." If such varieties are to be considered of good standing, future investigations with large series of reptiles would cause our lists of the North American serpents and lizards—many species of which vary almost individually as specimens—to attain stupendous proportions.

Habits.—The habits of this pretty creature in no way differ from those of the Northern form. Freshly captured specimens evince an irritable disposition, but soon become tame. They vibrate the tail rapidly when annoyed. If a newly caught specimen is handled, it will run its snout over the flesh in a deliberate fashion, as if seeking for a tender spot on which to employ its minute teeth and finally bite and retain its hold, advancing the jaws forward in chewing fashion in emphasis of its displeasure. Specimens in the writer's collection were indifferent in their feeding. A few were induced to take very young mice. One specimen ate a green snake (*Liopeltis vernalis*).

This is one of the useful reptiles. It leads a generally secretive life, prowling about stone piles or under the loose bark of fallen and decaying timber, in which situations it feeds largely upon wild mice and rats, occasionally varying the diet with lizards and snakes. If captive specimens are in good trim a mix-up is liable at feeding time. Fighting for a mouse the examples may knot into a constricting ball, in which the smaller ones are liable to be crushed.

The King Snakes

THE SOUTHERN MILK SNAKE; RED KING SNAKE

Ophibolus doliatus, (Linn.)

This reptile, supposed to be the ancestral form of the confusing variations coming under the technical head of *Ophibolus doliatus*, forms the connecting link between those varieties having blotches or saddles of a reddish hue on the back, these enclosed within a narrow black border, and the forms that are completely ringed about the body with the black, the yellow and partially or completely with the red. The typical form is smaller than either of the preceding varieties.

Colouration.—The red saddles are wider than with either of the preceding varieties, *the red reaching to the first row of scales and the black extending over the edges of the abdominal plates*. The smaller, alternating blotches contain little or no red, and extend along the edges of the abdominal plates.

The large blotches are usually rich scarlet, the spaces between them either yellow or grayish white. Examined from directly above, the snake appears to be marked with broad rings of scarlet and narrower rings of yellow, bordered with black. The abdomen is white or yellow, with numerous black blotches. The lower borders of the larger blotches sometimes fuse into parallel black bands on the abdomen—a phase of pattern eliciting the varietal name *parallelus*, of Prof. Cope.

The top of the head may be almost entirely black or reddish, with a broad black band—with some specimens largely yellow. Unlike the preceding varieties (*triangulus* and *clericus*) there is no pale band from behind the eye to the angle of the mouth.

Dimensions.—The general conformation is much like the preceding forms, but this form is distinctly smaller in size.

Distribution.—Maryland to Florida. In the northern portion of the range—westward to Illinois. In the southern portion, westward to Oklahoma and eastern Texas.

WESTERN MILK SNAKE; RINGED KING SNAKE

Ophibolus doliatus variety *gentilis*, (B. & G.)

In the consideration of this variety, we observe another phase of variation away from the ancestral form. While the preceding varieties have inclined toward a constriction of the red blotches, thus presenting a more *spotted* appearance than the

COMMON KING SNAKE; CHAIN SNAKE, *Ophiodon tereticauda*

A notoriously cannibalistic reptile of the Southeast. It kills and eats venomous as well as harmless serpents, and is immune to the bites of the former. Also feeds upon rodents. It is a curiously gentle reptile as regards its demeanour toward man.

BOYLE'S KING SNAKE, *Ophiodon tereticauda boylii*

Differs from the preceding only in the pattern and distribution. The range embraces Arizona and southern California.



HEADS OF MISCELLANEOUS HARMLESS SERPENTS

- | | | | |
|---------|--|---------|--|
| 1 | Pacific Brown Snake, <i>Contia mitis</i> . | 3 and 6 | Yellow-lipped Snake, <i>Rhodinea flavilata</i> . |
| 4 and 5 | Rock Snake (Genus <i>Hypsiglena</i>). | 7 " | 8 Scarlet Snake, <i>Cemophora coccinea</i> . |
| 12 " | 11 Rainbow Snake, <i>Abasus erythrogrammus</i> . | 3 " | 9 Sharp-nosed Snake, <i>Rhinachilus lecontei</i> . |
| 10 " | 11 Red-bellied Snake, <i>Farancia abacura</i> . | | |

typical form, the trend of variation with the succeeding forms is quite in the opposite direction—that is, the red areas are inclined to widen and their black borders to extend around the body as rings, producing much the same effect as the pattern of the venomous coral snakes (*Elaps*), hence these reptiles are among those serpents that “mimic” the poisonous colubrine snakes.

The status of the present variety is somewhat doubtful. It is the Western representative of the ancestral form, and extends well within the Western range of the latter. Some specimens are symmetrically ringed with the black; others have large black blotches on the abdomen beneath the red areas. It is possible that these differences should be recognised under distinct, varietal names, yet the confusing, intergrading forms cause one to hesitate before adopting such a course. Technical workers have much to do in solving this problem, one way or the other.

The Mexican Ringed King Snakes, recognised specifically under the technical head of *annulatus* or *micropholis*, are very closely allied to the present variety. An elaborate series of specimens might prove the array of forms extending through Mexico and Central America, to be simply a chain of varieties connecting with the North American forms.

Colouration.—Red bands above, more broadly bordered with black than existing with the other varieties of *doliatus* already described, the black usually encircling the body as pairs of rings; between these rings is a narrow area of yellow.

On many specimens, the space on the abdomen directly beneath the red is entirely suffused with black, the red extending downward to the abdominal plates. Both from above and from the side, such a specimen presents a ringed appearance. Above, the larger areas are rich scarlet.

On occasional specimens the black rings fuse into a smoky band along the back.

The entire top of the head is usually black with the exception of the snout, which is red.

As this is a very variable form, numerous specimens may be found that will greatly confuse the student in separating it from *doliatus*. The tendency of the black to form rings about the body; the extension of the red to the abdominal plates and the consequent absence of a black-bordered, saddle-like pattern are

The King Snakes

the most important points of discrimination. Besides these characters, it should be noted that there are no smaller, alternating blotches on the sides.

Dimensions.—This is a slightly larger reptile than the typical form, though of the same conformation. An adult specimen will measure about 28 inches.

Distribution.—Nebraska and western Louisiana to southwestern Texas and northern Mexico.

THE SCARLET KING SNAKE; "CORAL SNAKE"

Ophibolus doliatus, variety *coccineus*, (Schlegel)

The present form is the most pronounced and removed from the typical form of any of its varieties. It represents the greatest development of the *ringed* pattern, not only the black completely encircling the body, but the red and yellow as well. It is also the smallest of the forms, the most slender in proportion and possesses the most pointed snout. Compared with the most specialised of the *spotted* forms—the variety *triangulus*—the Northern Milk Snake, it might first appear, to the popular observer, in the discrepancy of size, entire difference of pattern and colours, form of body and shape of the head, to represent not merely a distinct species, but belong to a different genus as well. It has adopted burrowing habits. Degeneration has progressed rapidly. As an instance of this we find occasional specimens with the loreal plate (between the eye plate and the nasal plate) missing. If such a character were constant the snake would represent a very distinct species and be excluded from the genus *Ophibolus*. On such specimens the number of scale rows is also reduced—they have been described under the head of *Osceola elapsoidea*. As the intergrading forms are numerous—sometimes specimens with a loreal on but one side of the head—we cannot, at the present state of this reptile's development, give specific rank to specimens of this character.

Colouration.—Brilliantly ringed with scarlet, yellow and black. The scarlet rings are widest, and completely encircle the body with the majority of specimens; the yellow rings are about half the width of the red and bordered on each side by rings of black, which, on the back, are of about the same width as the yellow. On the sides the black rings become narrowed

The King Snakes

(owing to the widening of the yellow) and are very narrow or sometimes broken into blotches on the abdomen. On the abdomen, some of the yellow rings enclose spots. There is a yellow ring around the neck immediately behind the head; in front of it is a patch or band of black confined to the top of the head; the snout is red.

Variations.—Young specimens differ from the adults in possessing white rings in place of the yellow. On some adult specimens the red and yellow do not completely encircle the abdomen, which is white in the centre, irregularly blotched with black. The sides, however, present a perfectly ringed pattern which distinguishes such individuals from the typical form.

Dimensions.—This variety is of small size and slender of body, with a narrow head, not distinct from the neck and sharp and conical at the snout. The measurements are of a fully adult specimen from Marion County, Florida:

Total Length.....	14	inches.
Length of Tail.....	2½	"
Greatest Diameter.....	½	"
Length of Head.....	½	"

Distribution.—The southeastern United States, from central North Carolina, through Florida and westward to the Mississippi.

"Mimicry." The Scarlet King Snake and another serpent of an entirely different genus—the Scarlet Snake (*Cemophora coccinea*) are quite similar in their colours and pattern to a poisonous reptile, the Coral Snake (*Elaps fulvius*), that inhabits the same areas as each of the former reptiles. As a consequence they are sometimes mistaken for the venomous snake and *vice versa*. A brief key, with a few words of explanation, will enable the student to easily separate these specimens.

The distinctive differences may be thus outlined:

Ringed, with yellow, red and black	{	Red and yellow rings broad; <i>the yellow bordered with narrower rings of black.</i> Snout red; pointed.	SCARLET KING SNAKE
	{	Red and black rings broad; <i>the black bordered with very narrow rings of yellow;</i> snout black, blunt and rounded.	CORAL SNAKE

The King Snakes

Banded <i>above</i> , with red, yellow and black	{ Pattern above like Scarlet King Snake. <i>Immaculate, yellow- ish-white beneath.</i>	SCARLET SNAKE
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From the preceding it will be understood that the Scarlet King Snake and the Scarlet Snake are very similar in pattern. The sharp snout and similar proportions of each intensifies the resemblance. The latter species, however, may be immediately recognised by its immaculate white abdomen. The Scarlet King Snake might be confused with the Coral Snake upon a superficial examination owing to it being ringed with the same colours as the latter. A very simple formula to remember is this, which at once distinguishes each: The black rings of the Coral Snake are *broad, and bordered on each side by a very narrow yellow ring*. In the pattern of the small King Snake the yellow rings are fairly broad *and bordered on each side by slightly narrower rings of black*. The heads of the two reptiles are markedly different, that of the venomous snake, broad and rounded; that of the harmless species, sharp and conical.

Habits.—The Scarlet King Snake is a burrowing species, thus demonstrating in habits, as well in form, its degenerate character as compared with the other snakes of the genus *Ophibolus*. Specimens may be most commonly found under the loose bark of fallen and decaying trees. Here they prey upon the smaller species of snakes, lizards or upon very young mice that are yet in the nest. It is probable that this little snake issues at night from its lair and searches in crevices in the bark for various lizards that crawl into such places to sleep. This theory appears logical after an examination of a series of preserved specimens, in which the stomachs of several contained the remains of swifts (*Sceloporus*) and “blue-tail” lizards (*Eumeces*).

In captivity this snake evinces a very gentle disposition, seldom offering to bite. However, it invariably burrows into the soil of its cage or hides under loose objects, such as pieces of bark or flat stones. Thus it constitutes a very indifferent object for observation and study. While displaying a very indifferent appetite as a captive, it may be occasionally induced to take very young mice. Although diminutive in make-up, the reptile constricts its prey in exactly the same fashion as its larger and more powerful allies.

THE MEXICAN KING SNAKE

Ophibolus micropholis, (Cope)

Very closely allied to the Western variety of the Milk Snake group—*O. doliatus* and its varieties, this Mexican and Central American reptile exhibits an amazing degree of variation. Further investigations, with large series of specimens from various localities, may demonstrate that it is but a Southern variety of the former snake—*doliatus*. It attains a length of about a yard and is of moderate thickness.

Colouration.—The pattern of the phase occurring in northern Mexico and the extreme southwestern portion of the United States, is rather different from the ringed King Snakes of the latter country. The colouration consists of rather narrow black rings, each enclosing a very narrow and rather obscure ring of yellow. The black rings are separated by very wide interspaces of rich reddish-brown or scarlet—fully four or five times the width of the black.

The head is black above, with a bright yellow band across the rear portion. The chin is black, with a similar band.

It will be appreciated that the red greatly predominates. A superficial examination of the greater number of northern Mexican specimens might result in the impression of a brick-red snake, marked simply with rather narrow black rings at a considerable distance apart; the faint yellow rings within the black would be possibly overlooked. Curiously enough, the poisonous Coral Snake (*Elaps fulvius*) occurring in the districts inhabited by this distinct variety is marked in precisely a similar fashion—with one exception, and that so obscurely delineated as not to detract from the striking resemblance of pattern. Instead of the black ring enclosing a faint, streaky ring of yellow, the black rings of the poisonous serpent are faintly *bordered* with yellow. At a glance, it appears like the harmless serpent—a brick-red reptile with black rings at considerable distances apart. With both species the head is black, with a broad yellow band across the temples.

Dimensions.—The measurements are of an adult female specimen from the state of Sinaloa, in western Mexico:

The King Snakes

Total Length.....	36	inches.
Length of Tail.....	5	"
Greatest Diameter.....	$\frac{3}{4}$	"
Width of Head.....	$\frac{5}{8}$	"
Length of Head.....	1	"

Distribution.—The distribution of this phase of the Mexican King Snake is the extreme southern portions of Arizona and New Mexico and northern Mexico generally. The species to which it belongs extends southward throughout Central America. The varieties have not been systematically treated by technical workers.

THE BROWN KING SNAKE

Ophibolus rhombomaculatus, (Holbrook)

Moderate in size—attaining a length of about a yard. The body is fairly stout and cylindrical. The head is small and scarcely distinct from the neck.

Colouration.—Light brown above, becoming paler (yellowish) toward the abdomen and with about fifty-five rather obscure, reddish-brown blotches on the back. These blotches are irregular and wavy in outline and narrowly bordered with black; they are from 6 to 7 scales wide and from 2 to 3 scales long. On some specimens there is an indication of a smaller series of alternating blotches on the sides. The pattern is not distinct, and from a short distance the snake appears to be of a uniform, pale brown.

The abdomen is yellowish-white, often showing patches of pale salmon-red, arranged in tessellated fashion—and the entire surface sprinkled over with gray or black dots.

Dimensions.—Constituting one of the smaller species of the genus, this reptile seldom attains a length exceeding a yard. Its general proportions are much like those of a full-grown specimen of the Northern Milk Snake or House Snake—*O. doliaetus triangulus*. The measurements of a specimen captured near Groveton, Virginia, are given:

Total Length.....	34	inches.
Length of Tail.....	$4\frac{1}{2}$	"
Greatest Diameter.....	$1\frac{3}{8}$	"
Width of Head.....	$\frac{1}{2}$	"
Length of Head.....	$\frac{7}{8}$	"

The King Snakes

Distribution.—The distribution of this species is limited to a comparatively small area, and within the borders of its range it is nowhere abundant. Occurring in Maryland, it extends southward into South Carolina; it ranges westward only to the Allegheny Mountains.

Habits.—Like the other species of the genus the Brown King Snake exhibits an appetite that inclines toward cannibalism. It feeds upon the young of other snakes and upon lizards as well, but seems to prefer small rodents and birds.

The writer captured a large specimen in Fairfax County, Virginia, that lay stretched upon a grassy bank, enjoying the warm rays of a spring sun. When captured, it defended itself vigorously for the moment, but soon became quiet. Having no receptacle in which to place the snake, he carried it several miles coiled quietly about his hand. Its only symptom of anger was an occasional shaking of the tail.

The majority of the writer's specimens could not be induced to take other food than very young birds, and of these they were very fond. Some specimens refused these tempting morsels—from a serpent's standpoint—and ultimately starved to death. Generally speaking, these snakes are sluggish and uninteresting in captivity.

THE YELLOW-BELLIED KING SNAKE; BLOTCHED KING SNAKE

Ophibolus calligaster, (Harlan)

This is a considerably larger and a stouter species than the preceding, which it very much resembles in colouration. Its distinguishing features are the larger size, more distinct blotches, the head markings and the different *habitat*. The scales are in 25 rows—those of the preceding and closely allied snake in 23 rows or a lesser number.

Colouration.—Pale grayish-brown, with a series of dark brown blotches on the back, which are 8 to 10 scales wide and 2 to 3 scales long; these spots are narrowly bordered with black. There is a smaller, alternating row of blotches on the sides, and a yet smaller row at the edges of the abdominal plates. The abdomen is yellowish, usually with square, black blotches in the centre.

The King Snakes

Generally, the head markings are quite vivid.* There is a dark band across the forward portion of the head and an arrow-headed mark covering the central and rear portion of the head; from behind the eye to the angle of the mouth is another dark band. On the neck are usually two parallel bands, extending to the base of the head.

Dimensions.—General conformation similar to the preceding species, though slightly larger and proportionately stouter.

Total length of adult specimen 46 inches.
Length of tail..... 6½ "

Distribution.—The Central States. Indiana to Minnesota comprise the eastern and northern limits of the range which inclines southwestward to Kansas and northern Texas.

Habits.—Similar to the allied species—the Brown King Snake. It feeds largely upon small rodents, birds and lizards, and appears to be less addicted to cannibalism than some species of this genus. The greater number of captive specimens are shy and delicate, refusing all food and thus gradually dying of starvation. Occasional specimens that show traces of appetite, prefer very young birds to all other food.

THE DAVIS MOUNTAIN KING SNAKE

Ophibolus alternus, (A. E. Brown)

The present species appears to be very rare. The type specimen was taken in the Davis Mountains of western Texas, and was described by Mr. Arthur Erwin Brown, in the Proceedings of the Academy of Natural Sciences, of Philadelphia, in December, 1901.

Colouration.—Following is a portion of Mr. Brown's diagnosis of the type specimen:

"The ground-colour is slate gray, crossed on the back, at intervals of three to five scales, by bands of black which are alternately wider and narrower, the wide ones covering from 2 to 3 scales on the middle of the back, and more or less divided transversely on their centres with scarlet. The narrow bands are about one scale wide and wholly black, occasionally broken through by the ground-colour. On the neck the bands are narrower and less

*With the exception of a dark bar from behind the eye to the angle of the mouth, there are no head markings with the preceding species—*Ophibolus rhombomaculatus*, the Brown King Snake.

The King Snakes

defined, while the red is more pronounced on the posterior part of the body. There are nineteen red and black bands on the body, and an equal number of the intermediate black ones. On the tail there are 5 bands, which form quite distinct rings, on the last two of which the red is absent. The head, including the labials, is dark gray with small dark mottlings, not well defined, and a narrow black streak from the postoculars to the angle of the mouth. Ventral surface grayish white, heavily blotched with black, into which the black portion of the cross-bands run."

Dimensions.—Total length of the type specimen. .28½ inches.
Length of tail..... 4½ "

Distribution.—As yet, taken only in the Davis Mountains, Jeff Davis County, Texas.

ARIZONA RINGED SNAKE; RINGED KING SNAKE; "CORAL SNAKE"

Ophibolus zonatus, (Blainville)

Despite the vivid colouration of the King Snakes, this is the most beautiful species of the genus. It presents all the striking colours of the Scarlet King Snake—*O. doliaus coccineus*—of the southeastern United States, but is a much larger reptile and attains the length of a yard. The proportions are moderately stout and the head is fairly distinct from the neck. This snake appears to be most closely allied to the Western varieties of the succeeding species. There are 21 or 23 rows of scales.

Colouration.—The body is encircled with pale brick-red, white, and black rings. On the forward portion of the body, the black rings (which enclose the narrow rings of white) are narrow and the red rings are broad; toward the latter portion of the body, the red becomes constricted and the black predominates. On some specimens the latter character is so pronounced that the pattern may be given as white rings separated by broad rings of black which are split by narrow areas of red, or contain triangles of that hue. Such are the greater number of specimens from Arizona and Utah. California specimens are usually perfectly ringed with the red for the entire length of the body and are the handsomest phase of this species.

The snout is black. Across the head is a white band, broadening on the temples. Behind this is a black ring.

Dimensions.—Following are the measurements of an adult specimen from southern California:

The King Snakes

Total Length.....	30½ inches.
Length of Tail.....	4½ "
Greatest Diameter.....	1⅞ "
Width of Head.....	1⅞ "
Length of Head.....	1 "

Distribution.—Southern Utah and Nevada; southern California and Arizona.

Habits.—A single specimen of this beautiful reptile lived for about a year in the writer's collection. It was very shy in its feeding and could not be induced to take anything but very young mice, although very small snakes and lizards were frequently placed in its cage. While often handled by friends of the writer, it never attempted to bite, but would coil about one's fingers and become perfectly quiet as if enjoying the warmth of the hand.

SAY'S KING SNAKE

Ophibolus getulus, variety *sayi* (Holbrook)

This curiously spotted snake is one of the varieties of the largest species of the genus *Ophibolus*. It attains a length of 3½ to 4 feet. The body is stout and distinctly cylindrical (not tapering so gradually from the greatest diameter as do most serpents, but retaining a uniform thickness for a great part of the length). The head is small and but slightly distinct from the neck.

Colouration.—This form is, itself, subject to some variation, though the general tendency of the paler hue is to form a small spot in the centre of each scale.

The commonest phase is black, with a pale green or white spot in the centre of each scale. The abdomen is yellow, with large, black blotches.

On numerous specimens the spots evince a tendency to unite into narrow cross-bands on the back at regular intervals, which are about the same distance apart as the bands of the typical form. In the areas between these fused lines of spots, the other scales possess the same spotted appearance as with the first phase described. Other specimens possess this character carried to a more extreme degree. At regular intervals across the back, the spots unite in narrow, sharply delineated lines, while between these bands there are solid black areas; the scales on the sides,

The King Snakes

however, have green or yellow centres. Such specimens have been designated as the variety *splendidus* by Baird and Girard, but the variation is too superficial to be considered under a distinct head when compared with the many intermediate or connecting forms.

Dimensions.—Like the typical form* in proportions, though it does attain so great a length. About $3\frac{1}{2}$ feet when adult.

Distribution.—This variety takes the place of the typical form in the central portion of the United States. The range is from southern Illinois to Louisiana; westward in the North, through the southern portion of the plains, and in the South to western Texas.

THE COMMON KING SNAKE; CHAIN SNAKE; THUNDER SNAKE

Ophibolus getulus, (Linn.)

The typical form of this species is the largest of the King Snakes. It attains a length of six feet. The body is stout and cylindrical and the head small—but slightly distinct from the neck.

Colouration.—The greater number of specimens are black, with narrow yellow or white cross-bands, which fork on the sides and connect with one another in chain-like fashion. These bands are one and a half to two scales wide and separated by intervals of from five to ten scales. The abdomen is black, with large blotches of white or yellow.

Variations.—Specimens occurring from southern New Jersey to South Carolina are usually jet-black, with white, chain-like markings. Those found in Georgia, Alabama and northern Florida have yellow markings on a black or deep brown ground. In central and southern Florida a large number of specimens are brown, olive or green, with indistinct bands. Close examination of such specimens will reveal each scale to contain a pale centre. The light blotches on the abdomen generally match the hue of the bands on the back.

The jet-black specimens from the northern portion of the range, with their vivid white markings, are in strange contrast with pale, greenish specimens bands, from Florida,

* See the measure

typical form.

The King Snakes

but a varietal name would be inappropriate as every degree of connecting variations may be found in a large series of specimens.

This is a beautiful species. The scales of the back are polished and those of the abdomen glassy and lustrous, the latter reflecting, on specimens that have recently cast their skins, all the prismatic colours.

Dimensions.—This form of the King Snake is one of the largest of the North American serpents. In Florida, specimens of 6 feet in length are not of rare occurrence. From southern New Jersey to North Carolina, the average length of an adult specimen is from $3\frac{1}{2}$ to 4 feet. The measurements given represent a fairly large specimen from the Southern States:

Total Length.....	60	inches.
Length of Tail.....	$8\frac{1}{8}$	"
Greatest Diameter.....	$1\frac{1}{8}$	"
Width of Head.....	$\frac{7}{8}$	"
Length of Head.....	$1\frac{1}{8}$	"

Distribution.—With its varieties, this King Snake ranges over the entire United States south of latitude 40° .

The range of the present (typical) form is from the pine regions of southern New Jersey to Florida and westward to the Mississippi River. It is most abundant in the southern Atlantic Coast region.

While several zoölogical works have alleged that the King Snake occurs in southern New York—records being cited from Long Island, the writer doubts the accuracy of these statements.

Habits of the King Snake.

One of the most striking in pattern of the American snakes, extremely docile in disposition and displaying habits that render it highly useful to man in his agricultural pursuits, this serpent might be said to rank first in attractiveness of the various ophidian species embraced by this work, or to share that position with the fine Indigo Snake of similar *habitat*.

Of several species of the genus *Ophibolus*, all of which have been described as possessing cannibalistic habits, the King Snake displays this character to the strongest degree—in fact to such an extent that besides the promptings of its appetite this

The King Snakes

snake exhibits a pugnacious interest in other serpents that may be considerably larger than itself, engaging these creatures in a duel to the death, during which, however, they are able to make but little resistance, when encircled by the wonderfully strong, constricting coils of the enemy.

It is from this fighting disposition among serpents, that the King Snake has acquired its popular name. Supposition had it that this species relentlessly trails the rattlesnake, and other poisonous reptiles of which it is the natural enemy. This is not true for the King Snake takes no more interest in the rattlesnakes and other poisonous species than the common striped snake that may unconsciously prowl across its path. Moreover, this snake spends no time in actually *searching* for venomous reptiles that it may destroy them. If, accidentally, in its wanderings it meets a rattlesnake, there is certain to be trouble for the latter unless it continues on its way without hesitation, for the King Snake delights to pick quarrels over nothing and once aroused will coil itself tightly about its astonished adversary and begin to squeeze. Slowly the grip grows tighter and the victim, if it be venomous, uses its fangs freely upon the body of the tormentor, but to no effect, *as the King Snake is entirely immune to snake poison*. But the wounds enrage it. Winding the lithe body round and round the doomed creature, until every part of the shining length is engaged, it tightens with such strength that the victim is benumbed, unable to bite, and is quickly strangled. So powerful is this snake in proportion to its size, and aided as it is by great agility of motion, that even the large and strong constricting snakes of other species fall easy victims when attacked.

It must be explained, however, that such battles between the King Snake and the larger serpents are rather unusual, and it will be appreciated from the foregoing explanation that these occurrences are the results of *accidental* meetings. When the King Snake captures a serpent smaller than itself, the prey is overpowered in the fashion described and eaten. And it should be explained as well, in all due justice to the King Snake, that specimens of the copperhead snake, the ground rattlesnake as well as fair-sized representatives of the larger rattlers are frequently killed and eaten. From this fact alone, the species demonstrates its usefulness toward mankind. From the standpoint of economic value, however, the King Snake performs

The King Snakes

more beneficial work for the agriculturist in the destruction of the smaller rodents, so injurious to the grain.

The remarkable immunity of this serpent against the action of snake venom is not restricted alone to this one member of the genus, but on account of the larger size of the species, it has been subjected to more extended experimentation than the smaller and less hardy snakes of the group. While the majority of snakes quickly succumb to an injection of serpent poison, the King Snake may be repeatedly wounded by the fangs of a living serpent, or injected hypodermically, without showing ill effects from the introduction of the formidable fluid into its blood. Some three years ago, repeated experiments were conducted upon a large specimen that is now thriving. It was injected with the venom of the diamond-back rattlesnake, the copperhead snake, the moccasin and the West Indian "fer-de-lance," without showing any bad effects beyond an intimation of sluggishness appearing an hour or so after the injection and entirely passing away several hours later.

Despite its hostility toward other species of snakes, the King Snake shows a very mild nature with man. Specimens captured by the writer were in rather dry patches of timber; some were taken while basking in the sun of small glades in the forest; others were found hiding under fallen tree trunks. When first caught they strike vigorously, emitting a short hiss which sounds more like a sneeze; at such times the majority of specimens eject a powerful, musky odour from glands near the base of the tail. These vigorous symptoms pass away within a few minutes' time, when most specimens may be handled without evincing the least signs of bad temper. As captives, few reptiles are more gentle or devoid of nervousness than the present species—in fact, the King Snake and the big gopher or Indigo Snake may be said to be the ideal serpents for objects of study in captivity; both are very hardy and will live for years. The former will feed upon mice, sparrows and smaller snakes of other species. Unlike many serpents, it is not particular in demanding living prey, as it will readily take dead mice and rats, and sometimes strips of raw beef.

When being handled, these snakes will usually coil firmly about one's fingers to prevent themselves from falling. During these actions the muscular development of the snake may be

noted, and will be found to exist to a surprising degree in a creature of such moderate size. If frightened, some specimens coil themselves into a series of compact knots until they form a spherical mass; in this position they may be actually rolled about the ground without relaxing their bodies.

This species deposits from ten to twenty-four eggs, which require from five to six weeks to complete the incubation.

BOYLE'S KING SNAKE; CALIFORNIA KING SNAKE

Ophibolus getulus variety *boylei*, (B. & G.)

Considerably smaller and more slender than the Eastern (typical) snake. The scales are in 23 rows—occasionally 25.

Colouration.—Black or brown with white or yellow cross bands, which are narrow on the back and abruptly widened on the sides, thence crossing the abdomen as broad blotches. From this description it will be understood that the pale markings take the form of rings, instead of bifurcating and joining one another on the sides as do the bands on the typical form. With black specimens possessing white bars, the pattern is very striking.

The head is dark with the exception of the snout where the plates are pale or contain pale centres; there are often a few yellow dots on the temples. Both upper and lower lip plates are yellow, heavily bordered with black or brown.

The variety *californiae*: As this variety is very closely allied to Boyle's King Snake, it is best considered under that head. The body is black or brownish. Although there is a general indication of the white rings, these are much broken and interspersed with short stripes, which run lengthwise. On some specimens there is a tendency of the paler markings to unite in a stripe on the back. The head is coloured like the preceding variety. The abdomen may be entirely yellow or blotched with black.

Dimensions.—Both of these allied varieties are of a similar length. Following are the dimensions of a specimen of Boyle's King Snake, from southern California:

Total Length.....	32 $\frac{1}{2}$ inches.
Length of Tail.....	2 $\frac{3}{4}$ "
Greatest Diameter.....	$\frac{3}{4}$ "
Width of Head.....	$\frac{5}{8}$ "
Length of Head.....	1 "

The King Snakes

Distribution.—Boyle's King Snake inhabits western Nevada, western Arizona and California; it is most abundant in the latter state. The allied variety occurs in southern California and Lower California.

CHAPTER XXXVIII: THE RAINBOW SNAKES

Large and Brilliantly Coloured, Burrowing Serpents, of the Genera ABASTOR and FARANCIA

ALLEGED to be related to the tiny Worm Snake (*Carpophobis*), the Rainbow Snakes are, from all external appearances, strikingly different from their small ally. They grow to a large size—five or six feet—and their handsome colouration is not eclipsed by any other North American reptile; intensifying the brilliant pattern, is the opalescent lustre of the scales.

With all their beauty of colouration these serpents are degenerate burrowers and seldom show themselves above the ground. The body is stout and powerful, but tapers gradually to a more slender neck and a head that is small, flat and not distinct. The eyes, placed well forward toward the snout, incline upward; they are dull and have a minute pupil, like a pin-hole. In proportion to the size, the tongue is exceedingly small.

By a single character, technically considered an important one, the Rainbow Snakes are divided into two genera. This is the structure of the plate or plates following the nose shield or *rostral*. With *Abastor*, there is a pair of these plates—*internasals*. *Farancia* has a single *internasal* plate. In every other way these snakes are similar. The teeth of the upper jaw are of about equal size. There is no *preocular* plate, the *loreal* plate forming a portion of the front border of the eye. The scales are smooth and in 19 rows; ventral plate divided. Both *Abastor* and *Farancia*, represented by single species, are confined to the southern United States; both are most abundant in Florida.

Following is a condensed formula to aid in identification:

- A. Two *internasal* plates. Genus *Abastor*.
Blue-black, with three reddish stripes above.
Abdomen red, with rows of black spots.
RAINBOW SNAKE, *A. erythrogrammus*.
- B. One *internasal* plate. Genus *Farancia*.
Blue-black; upright, vermilion bars on sides. Abdomen
vermilion.
RED-BELLIED SNAKE, *F. abacura*.

The Rainbow Snakes

Detailed descriptions:

THE RAINBOW SNAKE

Abastor erythrogrammus (Daudin)

Also called Mud Snake. A large and very showy serpent, with smooth, glassy scales.

Colouration.—Purplish-black, or rich, dark blue; along the back from the neck to the tail are three stripes of dark red—sometimes deep orange. A band of pale yellow on the sides the width of three rows of scales.

Abdomen red, with two rows of large, blue-black spots, running the length of the body; between these is a row of much smaller spots, beginning some distance down the neck and extending to within a short distance of the tail.

Head dark, with obscure red markings; the upper lip plates are yellow and each contains a large, black spot.

Young specimens show the same pattern as the adult.

Dimensions.—The writer's largest specimen was 4 feet, 9 inches long, with a diameter of 2 inches at the thickest part of the body. This is considerably over the average size, given in the following table:

Total Length.	48	inches.
Length of Tail.	6½	"
Greatest Diameter.	1½	"
Width of Head.	7⁄8	"
Length of Head.	1⅓	"

Distribution.—Most abundant in the swampy, coastal region of South Carolina, Georgia and Florida. The range is from Virginia to the Gulf of Mexico. This snake does not extend as far westward as the succeeding species.

Habits.—The Rainbow Snake lives in swampy, timbered areas and along the borders of streams, where it burrows into the damp soil or into and under decayed and fallen trees. When freshly caught it will thrash about to escape, but seldom shows the least symptom of hostility.

As a captive, this snake always tries to hide in sand or moss, and lives but a short time unless provided with a substance in which it can burrow. Adult specimens cannot be induced to eat, but will live and continue vigorous for many months without

The Rainbow Snakes

other nourishment than water; they drink considerable quantities. Thus the food habits are practically unknown with the exception of the feeding of young individuals; they will occasionally take earthworms.

The Rainbow Snake is oviparous, depositing from 24 to 50 bluntly oval, white eggs, with a perfectly smooth integument. A four-foot specimen laid 43 eggs on the 7th of July; when deposited the eggs were $1\frac{1}{2}$ inches long and 1 inch in diameter; they hatched on September 15th. The young snakes were $9\frac{1}{4}$ inches long and $\frac{5}{16}$ of an inch in diameter at the thickest part of the body. Another snake laid 40 eggs on July 13th, and a third deposited 23 eggs on the 14th of August.

THE RED-BELLIED SNAKE

Farancia abacura, (Holbrook)

Also called the Rainbow Snake, Mud Snake, Horn Snake and Hoop Snake.

Proportions like the preceding.

Colouration.—Purplish-black above, with large, vermillion, inverted V-shaped blotches on the sides. Abdomen rich vermillion with numerous black patches.

The striking colouration and glassy surface of the scales, cause this animal to be very distinct. On young examples the red patches extend further up the sides, and there are indications of red on the back, in the shape of narrow cross-bands.

The sides of the head of the adult are reddish, with a row of large, black spots extending along the upper lip plates (*superior labials*).

Dimensions.—The Red-bellied Snake attains a maximum length of six feet. Following are the measurements of an adult of average size:

Total Length.	49	inches.
Length of Tail.	$6\frac{1}{2}$	"
Greatest Diameter.	$1\frac{1}{2}$	"
Width of Head.	$1\frac{1}{8}$	"
Length of Head.	$1\frac{1}{2}$	"

Distribution.—North Carolina, southward throughout Florida and westward to Louisiana (inclusive). In the Mississippi Valley the species has been found as far north as southern Indiana. It is most abundant in the Gulf States.

The Rainbow Snakes

Habits.—A burrowing animal, usually found in swampy stretches of timber, hiding under fallen and decaying tree trunks. Concerning the habits, Prof. E. D. Cope has written: "The Pamunkey River specimens were dug from a clay bank beneath ten feet of sand. Mr. Clarence B. Moore in his excavations of the Indian mounds of Florida, has dug it from nearly as great a depth beneath the surface, in sand."

Closely related to the Rainbow Snake, it resembles that serpent in habits so far as they are known. Very young specimens will eat earthworms. The writer has never succeeded in inducing mature examples to feed. They are indifferent to handling and shows no signs of temper beyond nervously twisting from side to side or coiling the tail about one's wrist. On the tail is a needle-like spine, so short as to be barely noticeable. This will often slightly wound the skin and is alleged by the negroes to be a "sting." When a specimen is replaced in its cage, it immediately burrows into the sand or moss and while taking no sustenance but an occasional drink, will live and continue vigorous for six or eight months. While degenerate in form—the eyes being small, dull, and poorly developed—and essentially fitted for a subterranean life, this snake is quite active and can glide over the ground with some speed and grace. It also swims and dives with considerable agility. The tongue is proportionately small and its movements are slow as compared with the quivering flash of that organ to be noted with the majority of snakes.

The species is oviparous—laying from two to four dozen bluntly oval, yellowish-white eggs, with a perfectly smooth integument.



RAINBOW SNAKE, *Abaster erythrogrammus*

Acquires its name from the rich hues of the longitudinal markings. Grows to a length of five feet and leads a burrowing life. Found in the Southeast



RED-BELLIED SNAKE, *Farancia abacura*

The bars on the sides are vermilion. This species inhabits the Southeast, attains a length of six feet, and is a burrower



WORM SNAKE, *Carphophis amoenus*

The illustration shows a life-sized adult. As becomes its worm-like structure the species is a persistent burrower



SCARLET SNAKE, *Cemophorus coccineus*

A beautiful species of eastern North America. The wide bands are rich scarlet. Abundant in South Carolina, Georgia, and Florida, under the loose bark of fallen trees



LECONTE'S SNAKE, *Rhinoceros incertus*

Some examples are ringed with brick red, others have square patches of this colour on the back. A Western serpent, rarely attaining a length of a yard. The food consists of snakes, lizards, and small rodents

CHAPTER XXXIX: THE SHARP-NOSED SNAKES

The Genera CARPHOPHIS, FICIMIA, CHILOMENISCUS, CEMOPHORA and RHINOCHILUS—Small, Burrowing Species, with Smooth Scales

FOLLOWING the rather miscellaneous smooth-scaled serpents of the preceding chapters, the writer is able to group several genera, and in fairly regular arrangement, under the title of the Sharp-nosed Snakes; *all of these have smooth scales*. As most of the species to be described are persistent burrowers, the snout is either conical, or much depressed and with a sharp edge—hence a striking characteristic that may be immediately understood by the beginner.

Key to the Sharp-nosed Snakes

- A. Size small. Plates under the tail *divided*.
- a. Ventral plate *divided*.
 1. Colouration uniform—no rings or blotches.
Head very small and sharply conical; no *preocular* plate—*loreal* touching eye; one *postocular* plate.
Scales in 13 rows. Genus *Carphophis*.
Brown above; pink beneath.
WORM SNAKE, *C. amoenus*.
Distribution.—New England to Florida; westward to Kansas.
 2. Colouration in transverse blotches or half-rings, red forming one of the colours.
Head slightly distinct; snout very sharp and conical—slightly upturned; rear border of the *rostral* extended backward on head. No *loreal* plate. One *preocular* plate. *Scales in 17 rows.* Genus *Ficimia*.
Reddish or orange, with brown, black-edged cross-bands, breaking into spots on sides. Abdomen yellowish.
DOG-NOSED SNAKE, *F. cana*.
Distribution.—Southwestern U. S. and Mexico.
Head not distinct; snout, as seen from side, very sharp—appears rounded, from above. No *loreal* plate.
One *preocular* plate. *Scales in 13 rows.*
Genus *Chilomeniscus*.

The Sharp-nosed Snakes

Red or orange; broad black cross-bands, terminating near abdominal plates; tail ringed with black.

RED AND BLACK GROUND SNAKE, *C. ephippicus*.

Distribution.—Nevada and Arizona.

Similar to preceding, but the black encircles the body—narrower on abdomen.

ARIZONA GROUND SNAKE, *C. cinctus*.

Distribution.—Arizona; Lower California.

b. *Ventral plate entire*.

Snout conical; head not distinct. A *loreal* plate. One or two *preocular* plates. Scales in 19 rows.

Genus *Cemophora*.

Wide scarlet blotches, separated by pairs of black half-rings, these enclosing a half-ring of yellow.

SCARLET SNAKE, *C. coccinea*.

Distribution.—South Carolina to Florida; westward to Mississippi.

B. Size moderate. Plates under the tail *entire*.

Head slightly distinct and pointed; front surface of nose plate flattened. A *loreal* plate; one or two *preoculars*. Scales—of the North American species—in 23 rows.

Genus *Rhinocbilus*.

Alternate, *square*, black and reddish blotches.

LE CONTE'S SNAKE, *R. lecontei*.

Distribution.—Western Texas to California.

The Genus *Carphobphis*: But one species seems worthy of recognition and this is a small, worm-like reptile, confined to North America. A description is given:

THE WORM SNAKE

Carphobphis amænus, (Say)

Size very small. Body moderately stout, with smooth, opalescent scales; head not distinct from the neck and terminating in a pointed snout. The eyes are very small.

Colouration.—Chestnut-brown above; salmon-pink on the lower portion of the sides and the abdomen. With alcoholic specimens this latter colour fades to yellow.

Variations.—Specimens of an opalescent, purplish-black above and pink beneath, are found along the Mississippi Valley and westward to Kansas. They have been described as a distinct species, under the scientific appellation of *Carphobphis vermis*. However, the points employed in separating this form from the typical snake are superficial, and the former reptile appears

The Sharp-nosed Snakes

to constitute but a colour variation. Young specimens are always much darker than the parent. During the second year they change from a dark gray to the brown of the adult specimen.

Dimensions.—The measurements given are of an adult.

Total Length	9½ inches.
Length of Tail	1¾ "
Greatest Diameter	¾ "
Width of Head	7/32 "

Distribution.—Southern Massachusetts, southward to the Gulf of Mexico; westward to Kansas. The species is particularly abundant in the Black Mountains of North Carolina.

Habits.—While quite abundant in many districts, this worm-like reptile is not commonly seen. It may sometimes be found wandering over damp leaves in the woods, after heavy rains, but its diminutive size and sober colours render it inconspicuous when abroad from its subterraneous haunts, and the species is considered rare in many localities where careful search would reveal the presence of numerous specimens. These snakes are often unearthed by the plough, they may also be found under the soft, loose bark of fallen and decaying tree trunks, or in the mouldy deposits, consisting of fallen leaves and disintegrating vegetation that exist in timbered regions. The species feeds largely upon earthworms and the soft-bodied grubs of insects. In captivity it always endeavours to secrete itself and lives but a short time unless provided with moss and leaves or sand in which to hide. It is a very mild-tempered reptile and can seldom be induced to bite.

The Worm Snake is oviparous, depositing a small number of elongated, soft eggs during the later part of July or early in August. The young snakes are rather large in proportion to the size of the parent, though beside a half-grown earthworm, they appear diminutive. A freshly hatched specimen measures 3½ inches in length, and slightly less than an one-eighth of an inch in diameter at the thickest part of the body. It is very probable that the larvæ of ants form a large part of the food of these minute reptiles.

The Genus *Ficimia*. Several Mexican species are recognised; one occurs in the United States.

Size rather small; body stout; head slightly distinct. Snout sharp and conical; slightly upturned. Examined from above,

The Sharp-nosed Snakes

the head looks much pointed; from the side, the effect is similar to the Hog-nosed Snakes, *Heterodon*—described in a succeeding chapter, but from those serpents the present reptile may be easily told by its smooth scales.

The teeth of the upper jaw are smooth and of equal size. The rear border of the *rostral* (nose) plate, extends backward on the head between the pair of plates (*internasals*) situated near the snout, and the *prefrontals* (the pair following the *internasals*).

THE DOG-NOSED SNAKE

Ficimia cana, (Cope)

Scales in seventeen rows. No *loreal* plate.

Colouration.—Reddish or orange-yellow, with reddish-brown, dark-edged cross-bands, about thirty in number, which show a tendency to break up into spots or small blotches on the sides. Abdomen immaculate yellowish-white.

A brown band crosses the head in front of the eyes, extending downward to the lip plates; there is another band across the rear portion of the head.

Dimensions.—Length about 8 inches, of which the tail occupies about $1\frac{1}{2}$ inches.

Distribution.—Western Texas to Arizona; northern Mexico.

The Genus *Chilomeniscus*: The species are persistent burrowers. Their standing is rather doubtful; some authorities recognise at least four, while others reduce the number to two or one.

In place of the conical snout of *Ficimia*, the head of the present snakes is much flattened, almost spoon-shaped—though not distinct from the neck—and the sharp-edged *rostral* forms a useful scoop for burrowing; the rear border of this plate extends backward on the head, separating the first pair of shields—the *internasals*. There is no *loreal* plate. The scales of the body are in thirteen rows.

THE RED AND BLACK GROUND SNAKE

Chilomeniscus ephippicus, (Cope)

The rear border of the rostral plate reaches the edge of the second pair of plates behind it—separating the first pair (the *internasals*).

The Sharp-nosed Snakes

Colouration.—Red or deep orange, with black cross-bands, which nearly reach the abdominal plates; the lower ends of these bands are rounded; they are separated by interspaces of ground-colour about as wide as the bands themselves. The black extends about the tail to nearly form rings, but is narrowly broken in the central portion of the undersurface. Top of head black; snout red.

Dimensions.—Total length about 9 inches; tail, 1½ inches.

Distribution.—Nevada and Arizona—probably to southern California.

THE ARIZONA GROUND SNAKE

Chilomeniscus cinctus, (Cope)

Differs from the preceding by an arrangement of the head shields: "Nasal separated from the preocular by the prefrontals, which reach the labials." The colouration is also different.

Colouration.—Reddish-white, the body encircled by broad black rings, which are narrower on the abdomen.

Distribution.—Three specimens are known; two were taken in southern Arizona and the other in Lower California.

The Genus *Cemophora*: One species known. It is brilliantly marked with scarlet, yellow and black. Head small and sharply conical, the *rostral* plate projecting forward slightly, in pointed fashion. A *loreal* plate; scales in 19 rows; ventral plate entire.

THE SCARLET SNAKE

Cemophora coccinea, (Blumenbach)

Also called Coral Snake. It is one of the species that "mimics" the poisonous Coral Snake (*Elaps*).

Size small; body moderately slender and very cylindrical—not tapering until near the head and tail; head not distinct. Snout pointed and projecting; eye small. One or two *preocular* plates.

Colouration.—Wide scarlet blotches, separated by pairs of black half-rings, the latter enclosing a yellow half-ring about three scales wide. The scales in the yellow band are usually tipped or dotted with black. *Abdomen immaculate white or yellow*. Top of the head red or orange, with a black bar across the eyes.

The Sharp-nosed Snakes

If the snake is examined from directly above, the pattern seems to be composed of wide crimson or scarlet rings, separated by pairs of black ones, the latter enclosing an equal-sized ring of yellow. It is this ringed aspect that causes the species to look like the Coral Snake and the Scarlet King Snake (*Ophibolus doliatus coccineus*), but the poisonous snake (*Elaps*) has broad scarlet rings and equal-sized rings of black, while the yellow is very narrow—barely a scale—and borders the black; moreover, when we speak of *rings*, it should be understood that the colours completely encircle the body. The Scarlet King Snake (*Ophibolus*) is exactly like *Cemophora* above, but the former is *ringed* with the colours. Examined from the side, the Scarlet Snake might elicit a description, thus: Large scarlet blotches broadly bordered with black, and separated by bands of yellow.*

Dimensions.—The writer's largest example is 25 inches long and one-half of an inch in diameter at the thickest part of the body. It was captured near Micco, Florida, and easily swallowed full-grown mice; this is considerably over the average size, which is given:

Total Length.....	16	inches.
Length of Tail.....	2½	"
Greatest Diameter.	¼	"
Width of Head.	1½	"
Length of Head.	½	"

Distribution.—The southeastern United States; South Carolina (inclusive) throughout Florida and westward to the Mississippi River. Most abundant in the low, coastal region.

Habits.—The handsome little Scarlet Snake resembles the King Snakes in habits, feeding upon such small creatures as the ground lizard (*Lygosoma*), the "blue-tail" (*Eumeces*), the brown snake (*Haldea*) and the young of the ring-necked snake, (*Diadophis*), besides the young of wild mice. The writer has collected numbers of these reptiles under the bark of fallen and decaying trees. In such conditions, when disclosed, their brilliant colours are in startling contrast to the sombre hues of the damp wood. The species appears to be very secretive and to pass most of the time burrowing its way with the aid of the sharp snout in a search for the prey. Owing to the prevalence of insect

* Young specimens have milk-white bands, separating the black bands or half-rings.

The Sharp-nosed Snakes

larvæ in the hiding places, it seems probably that the young snakes feed upon such.

A specimen in the writer's collection displayed interesting habits. When handled, it never showed a disposition to bite, which mild nature has been noted with the species generally. Most of its time was spent under a strip of bark, but when a very young mouse was placed in the case, the snake would glide rapidly for it, seizing the rodent with a dart of the head and then coil tightly about the animal, showing the species, although diminutive in size, to be a typical constrictor. On the 23d of June, this specimen deposited eight eggs; they were white and elongated, and covered with a soft, smooth integument. The snake appeared to take an interest in them and coiled always nearby, or around them, a proceeding quite unnecessary from the standpoint of space within the box, as the strip of bark, under which the snake was in the habit of hiding, was over a foot in length. Three weeks after the eggs were laid, one of them was opened to ascertain the process of development; it contained a well-formed embryo, which would have emerged within two weeks' time. A week later, on lifting the bark to examine the snake and her eggs, the creature was found much distorted, having swallowed the remaining seven, which she fully digested within a few days. This remarkable instance of cannibalism was quite inexcusable, as the reptile had been fed at regular intervals.

The Genus *Rhinobilus*: Several species are recognised; one is found in the United States. Among colubrine serpents, *these snakes are remarkable by the formation of the plates under the tail; these are usually entire*, in place of being divided; the ventral plate is entire. Rostral plate sharp and somewhat protruding; flattened on its under surface. Body moderately stout; head slightly distinct.

LECONTE'S SNAKE

Rhinobilus lecontei, (Baird & Girard)

Size moderate—often a yard long. Head scales normal; usually one large *preocular* plate; one *loreal* plate. Scales in 23 rows.

Colouration.—The pattern is difficult to describe and quite variable. There are usually alternating black and red blotches on the back, the latter perfectly square; the black extends farther downward on the sides. On the lower part of the sides

The Sharp-nosed Snakes

many of the scales may be orange with red centres, and others red with black centres.

On many specimens, the paler (square) blotches on the back are deep orange, with a brick-red dot in the centre of each scale.

Frequent specimens are black with brick-red half-rings. These are sometimes called "coral" snakes.

Abdomen white or yellow, with black blotches on the ends of some of the plates.

The single plates under the tail should at once indentify this species.

Dimensions.—Total Length..... 2 feet.
Length of Tail..... $3\frac{1}{2}$ inches.
Greatest Diameter..... $\frac{1}{2}$ "
Width of Head..... $\frac{7}{8}$ "
Length of Head..... $1\frac{1}{8}$ "

Distribution.—Western Texas and southwestern Kansas to California.

Habits.—Much like the Scarlet Snake (*Cemophora*). It is a constrictor, feeding upon small rodents, lizards and the young of other snakes. The young are produced from eggs.



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THE HOG-NOSED SNAKES

- 3, 4 Black Hog-nosed Snake, *Heterodon platyrhinus niger*
 2, 5 Common Hog-nosed Snake, *Heterodon platyrhinus* (typical)

- 5, 7 Florida Hog-nosed Snake, *Heterodon simus*
 6, 8 Texas Hog-nosed Snake, *Heterodon nasutus*

COMMON HOG-NOSED SNAKE, *Heterodon platyrhinus*.

The three species of *Heterodon* are characteristic in having a sharply upturned snout, and, owing to peculiar habits. When annoyed they flatten the head and neck to a great extent and hiss loudly. Their hostile airs have placed them in bad repute, yet they are entirely harmless and seldom attempt to actually bite. They feed entirely upon toads and frogs.

BLACK HOG-NOSED SNAKE, *Heterodon platyrhinus niger*

The *habui* embraces the Eastern and Central States, as does that of the typical form.

CHAPTER XL: THE HOG-NOSED SNAKES

GENUS HETERODON

Three North American Species that are Interesting from Their Peculiar Form and Habits

THICK-BODIED, pugnacious in aspect and actions, and provided with a peculiar upturned and shovel-like snout, the snakes of this genus may be readily recognised. Their scales are keeled, imparting a dull surface to the body, while the pattern is arranged in rather striking cross-bands or blotches, all of which characters tend to place these creatures in very bad repute in the minds of many popular observers. However, this condition has been intensified by habits these snakes evince of flattening the head and neck to a great degree and hissing loudly. They are the familiar and dreaded puff "adders," flat-headed "adders" or sand "vipers." In spite of their antics, they are quite harmless, and, in fact, their manœuvres consist largely of bluff for they rarely attempt to bite.

In the habit of dilating the neck, these snakes resemble the cobras of the Old World and the process is performed in the same manner as with the latter reptiles—namely, by means of long ribs that lie close against the backbone when the body is in a passive condition, and spread laterally when the snake is excited or angry.

With the species of *Heterodon*, the dentition differs from that of the greater number of the harmless, colubrine snakes. On each side of the back portion of the upper jaw, separated by some space from the other teeth, are two large, fang-like teeth. These are entirely devoid of poisonous properties, however, and are employed by the snake to hold its prey, as the reptile possesses no power of bodily constriction. These snakes feed principally upon toads.

Three species of the Hog-nosed Snakes—these comprising the entire genus *Heterodon*—inhabit North America. They frequent dry, sandy places. An outline of these species is given:

The Hog-nosed Snakes

a. *Central portion of abdomen yellow or greenish.*

Ground-colour yellow, brown, reddish or olive, with large, dark blotches on back and smaller ones on sides. Sometimes entirely black. Pattern rather irregular.

COMMON HOG-NOSED SNAKE, *H. platyrhinus*.

Distribution.—Massachusetts to Florida; westward to the Missouri.

Gray or brown, with large blotches on back and smaller ones on sides. The pattern is fairly regular. Smaller than preceding species, with sharper snout.

SOUTHERN HOG-NOSED SNAKE, *H. simus*.

Distribution.—Florida and Georgia to the Mississippi.

b. *Central portion of abdomen, black.*

Yellowish; large blotches on back and two rows of smaller ones on sides. Snout very sharply upturned.

WESTERN HOG-NOSED SNAKE, *H. nasicus*.

Distribution.—United States west of the Mississippi; northern Mexico.

Detailed descriptions of these species follow:

THE COMMON HOG-NOSED SNAKE *

Heterodon platyrhinus, (Latreille)

The largest species attaining a length of over a yard. With its very thick body, triangular, flat head and turned-up nose, it looks highly formidable.

Colouration.—The body-colour may be yellow, brown or reddish, with an irregular pattern, consisting of large patches of dark brown or black upon the back from the neck to the base of the tail, where they assume the formation of half-rings. These blotches are separated by interspaces of ground-colour that show a more intensified hue than upon the sides. In alternation with the blotches on the back is a row of smaller blotches on each side. The edges of the abdominal plates are generally blotched or profusely spotted with black. The central portion of the abdomen is yellowish or greenish.

Variations.—The variability of shades in the ground-colour of different individuals and the arrangement and size of the blotches are great. Many specimens have a tinge of bright brick-red upon the neck, while the remainder of the body is marked in ordinary fashion. At the time of compiling this de-

* Also known as Spreading Adder, Puff Adder, Flat-headed Adder, Blow Snake and Sand Viper.

The Hog-nosed Snakes

scription, the writer has before him a specimen with yellow body colours which gradually assume a reddish hue toward the head, and for a distance of about two inches the neck is brick-red and in bold contrast to the other colours. Another specimen shows a ground-colour of the same tinge (red) for more than half the length of the body, while the spots of the back fuse into those of the sides, giving the snake the appearance of being strongly banded with red and black. A third specimen is olive green, with the spots very indistinct upon the back, where slightly paler patches of colour show what should be the spaces between them. Specimens found in very dry and open sandy places are usually light in colour, while those frequenting wooded districts show darker shades.

With few exceptions, the head is of a uniform brown or yellowish-brown, with a dark band crossing the top, slightly in front of the eyes. Behind the eyes is a broken band, from which radiate two others extending into the neck, where they widen to form two large patches. A short band extends from the eye to the angle of the mouth.

Freshly hatched specimens resemble the parent in pattern, but show more vivid colours.

Dimensions.—The measurements given are of an average-sized specimen:

Total Length.	28	inches.
Length of Tail	4 $\frac{1}{4}$	"
Greatest Diameter.	1 $\frac{1}{4}$	"
Width of Head.	1	"
Length of Head.	1 $\frac{3}{8}$	"
Height of Rostral (the nose shield).	$\frac{1}{4}$	"

The largest specimen examined by the writer measured 40 $\frac{1}{4}$ inches in length. It was taken near Raleigh, North Carolina. Another specimen, 37 inches long, came from Sullivan Co., N. Y.

Distribution.—The wide distribution may be concisely outlined thus: Southern Massachusetts to Florida (inclusive) and westward to the eastern slopes of the Rocky Mountains. An abundant species in dry, sandy places.

Habits of the Hog-nosed Snake

Owing to one habit at least, the Hog-nosed Snake is odd among serpents. This is the trait of feigning death when fright-

The Hog-nosed Snakes

ened and finding escape impossible, for the species is so thick-bodied that it is unable to get over the ground with any show of speed. Among serpents, the habit in question is limited to the species of a very few genera. The Hog-nosed Snakes are not restricted to this one interesting character. They may best be illiterately, but concisely, described as "bluffers."

When the Hog-nosed Snake first discovers danger, its first impulse is to make for safety, but owing to its custom of traversing sandy areas or ploughed fields where it flattens to enjoy the sun, shelter is a long way off and out of the question. Realising that it cannot escape the object of its fright, the snake's first move is to inspire fear on the part of the enemy that the latter will leave it with the thought that venom is part of its make-up. Taking a long breath, that it may expand its stubby body as much as possible, the snake follows this move by flattening the head and neck to such an extent that the neck becomes fully three times the normal width, causing the colours to stand out vividly on the distended skin while the head assumes the most formidable outlines. It may be said in justice to the reptile's antics that a Hog-nosed Snake, playing this game of bluff is the personification of villainy, and an angry copperhead beside it, in spite of that reptile being genuine among the dangerous, would appear quite angelic to a popular-minded observer.

While flattened and in every way over-doing the actions of the most deadly snakes, the reptile ejects the deep breath it has taken in a long, sharp, hissing sound. This manœuvre completes a picture of ferocity seldom to be seen among serpents. The writer has watched the majority of the world's most deadly snakes assume their various fighting attitudes, but he will give this harmless and really *gentle* creature the credit for appearing even more hostile than the African vipers which are among the most fear-inspiring in aspect of any of the really poisonous serpents.

During these very hostile symptoms the Hog-nosed Snake continues to hiss with energy and strike repeatedly at the object of its annoyance. To one understanding snakes, the actions are amusing, for *if the hand be placed within reach of the snake's jaws it is never bitten*, and it must be explained that during all these feints, the snake cannot be induced to bite. Its object is simply to frighten away the enemy in order to render possible an escape.

The Hog-nosed Snakes

If these fighting symptoms do not produce the desired effect of freeing it from molestation, the Hog-nosed Snake tries different tactics. Suddenly opening its mouth, it appears to be injured and to lose strength. Then a convulsion seemingly seizes the snake, as it contorts its body into irregular undulations ending in a spasmodic wriggling of the tail when the reptile turns on its back and lies limp and, to all appearances, dead.

So cleverly and patiently does the snake feign death that it may be carried about by the tail for half an hour or more, hung over a fence rail where it dangles and sways to a passing breeze, or tied in a knot and thrown in the road, and to all of this treatment there is no sign of life *except from one condition*. In spite of this remarkable shamming the snake may be led to betray itself if placed upon the ground on its crawling surface. Then like a flash it turns upon its back again and once more becomes limp and apparently lifeless. It appears, according to this creature's reasoning, that a snake to look thoroughly dead should be lying upon its back. This idea is persistent, and the experiment may be repeated a dozen times or more.

Should the observer retreat some distance away, while the reptile lies thus, or he seek nearby concealment, the craftiness of the animal may be realised. Seeing nothing further to alarm, the serpent raises its head slightly and surveys its surroundings, and if there is no further sign of the enemy it quickly rolls over upon its abdomen and glides away as fast as its thick body will carry it. But at such a moment a move on the observer's part would send the reptile on its back again, with ludicrous precipitation.

With such hostile airs and thick-set body, this snake is generally regarded throughout the regions it inhabits as having fangs and a poison to correspond with its deadly appearance. Nor can those that entertain this idea be blamed when we consider the lack of popular works on the American reptiles, and the time-worn explanation that "the poisonous snake may be told at a glance from the harmless one by the triangular head and thick body"—which outlines are displayed by a large number of our harmless snakes when irritated, in fact to such an extent that many of them assume the character more distinctly than the dangerous snakes themselves.

In some sections the Hog-nosed Snake is thought to be so

The Hog-nosed Snakes

poisonous that its very hiss is the exhalation of a venomous breath. The reptile is known by such formidable names as "Flat-headed Adder," the "Puff Adder," the "Spreading Viper" and "Blow Snake." In many districts it is mistaken for the copperhead snake.

The food of this snake seems limited to toads and frogs. It much prefers the former. As explained in the description, the light specimens occur usually in very dry, sandy places, while the darker forms are found in woods or moist situations. The dark specimens will usually eat both frogs and toads; the light specimens, with few exceptions, refuse frogs altogether and confine their diet to toads. The species feeds voraciously in captivity. The majority of specimens will so gorge themselves that further feeding is temporarily impossible. The wide head and great elasticity of the jaws enables this snake to swallow very large prey in proportion to its size. It is not unusual for a small snake to engage in a struggle with a very large toad; the toad may be possibly three or four times the diameter of the thickest part of the snake's body, and the little reptile may be rolled and dragged about by the batrachian for nearly an hour, but finally engulfs the toad, which so distends and weighs down the serpent's body that it drags itself with great difficulty to a place of concealment to await assimilation of the meal. During the process of swallowing a large and vigorous toad the reptile is greatly aided by the pair of large teeth in the rear of the mouth, which, being sharply recurved, hold the struggling prey in a grip that seldom fails.

The Hog-nosed Snake is oviparous, depositing about two dozen eggs, during the latter part of July. The eggs are white and leathery, and like most snake eggs are so deposited in a cluster that they adhere together. As has been noted with serpents' eggs in general, they absorb moisture as they develop and gradually increase in size. Just prior to the time of hatching they are at least a third larger than when laid and distorted in form; they are then rather spherical instead of elongated as at the time of deposit.

THE BLACK HOG-NOSED SNAKE; BLACK "ADDER"

Heterodon platyrhinus, variety *niger*, (Baird & Girard)

This formidable looking reptile is but a colour variety of the preceding snake. While the writer is not in favour of

The Hog-nosed Snakes

naming varieties from difference of colour alone, the total absence of pattern from large numbers of specimens which are black or very dark gray, points to a character that should be recognised for the guidance of the popular student and the beginner in this branch of zoölogy.

Colouration.—Above, the body is very dark gray, or slaty black, with no trace of pattern.

The top of the head is black, but the upper lip plates (*superior labials*) are white, with a tinge of black at their borders or sprinkled with black dots. The flat portion of the upturned snout is also white, as is the chin and throat; farther down the undersurface the white fades into gray.

Dimensions.—In size, this variety agrees with the typical form. The largest specimen examined showed the following measurements:

Total Length.....	36	inches.
Length of Tail.....	5½	"
Greatest Diameter.....	1½	"
Length of Head.....	1¾	"
Width of Head.....	1½	"

This specimen was captured in Sullivan County, New York.

Distribution.—The Black Hog-nosed Snake is distributed over the same area as given for the typical form.

THE SOUTHERN HOG-NOSED SNAKE

Heterodon simus, (Linn.)

Considerably smaller than the preceding species—attaining a length of about twenty inches—and stouter in form. The shovel-like rostral plate (on the snout) is more prominent and very sharply upturned.

Colouration.—Pale brownish-gray above; with a series of large, rather irregular patches of blackish-brown on the back; between these blotches the body-colour is slightly paler than on the sides. Beneath these spots, on each side of the reptile, is a row of smaller spots, in alternation with those above.

With the exception of this smaller row of spots on the sides the ground-colour presents a plain, unspotted surface, and the abdomen is likewise immaculate. This is in contrast to the preceding and more generally distributed species, with which the sides of the reptile

The Hog-nosed Snakes

and the edges of the abdominal plates are profusely spotted or blotched with black.

At a glance, the pattern of the present species appears plainer—more sharply defined—than with the commoner snake, although the arrangement of the bolder markings is very similar.

There is a broken band across the top of the head, and another from the eye to the angle of the mouth. On the nape are two large blotches.

Variations.—The body-colour varies from gray to yellow. Many specimens have a tinge of brick-red on the neck or over a considerable portion of the forward part of the body.

Dimensions.—The measurements of a specimen taken in Hampton County, South Carolina, are given:

Total Length.....	18½	inches
Length of Tail.....	2½	"
Greatest Diameter.....	¾	"
Width of Head.....	¾	"
Length of Head.....	1½	"

Distribution.—Of limited distribution, this snake occurs from South Carolina, inclusive, throughout Florida and westward to the Mississippi.

Habits.—Stouter in body and with very abruptly upturned snout, this species when irritated succeeds in looking yet more hostile than the preceding. It is greatly dreaded by the Southern negroes, who believe its actions portray venomous powers quite equal to the rattlesnake. On all sides it is mercilessly slaughtered as the "Blow Snake" or "Sand Viper."

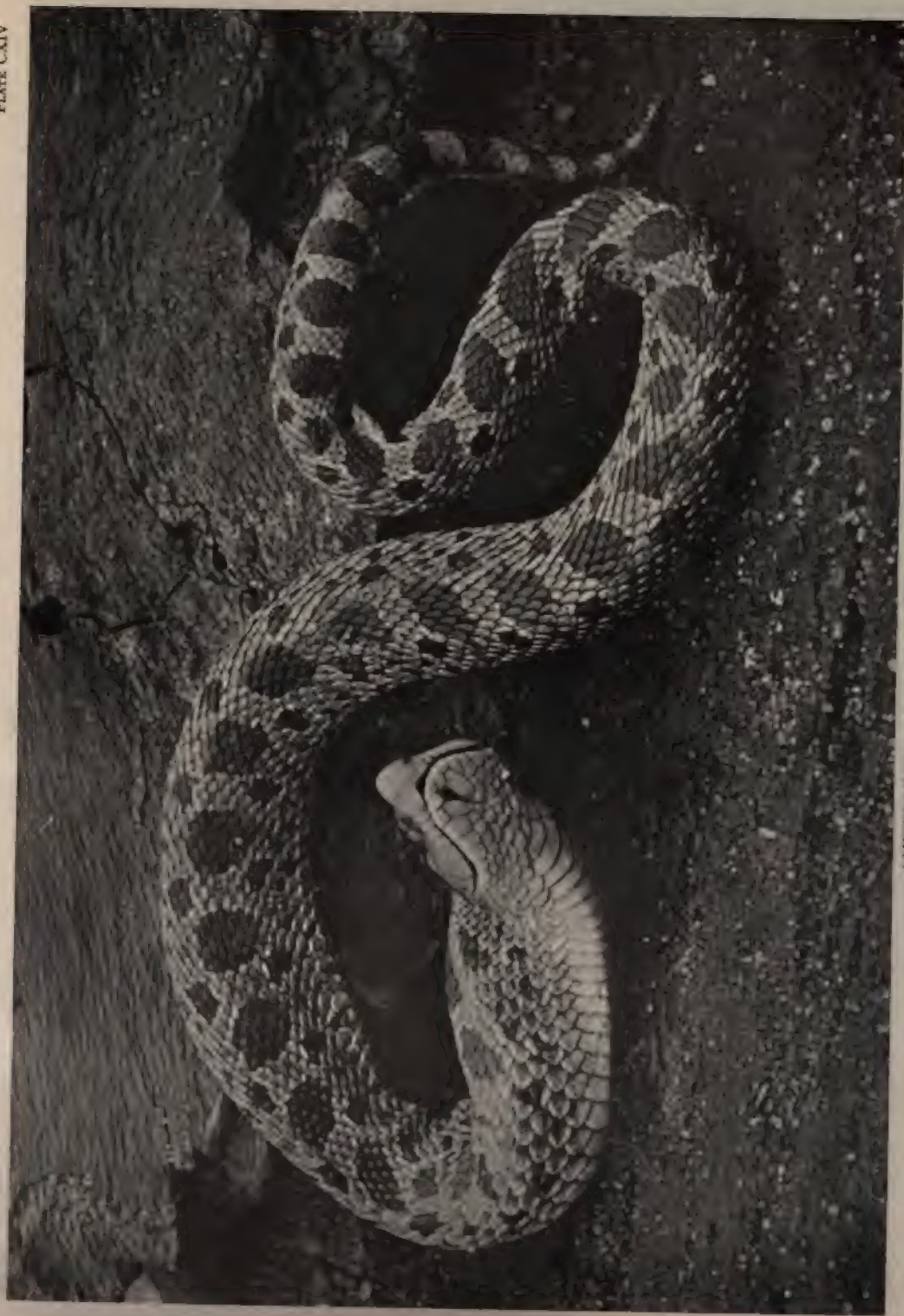
In habits the species is very similar to the Common Hog-nosed Snake. The majority of specimens taken by the writer were sunning in the cotton fields. It is much less abundant than the allied species and unlike the latter, which often wanders into the timber, appears to have a decided preference for dry and open places.

Captive specimens will eat both toads and frogs, but they prefer the former.

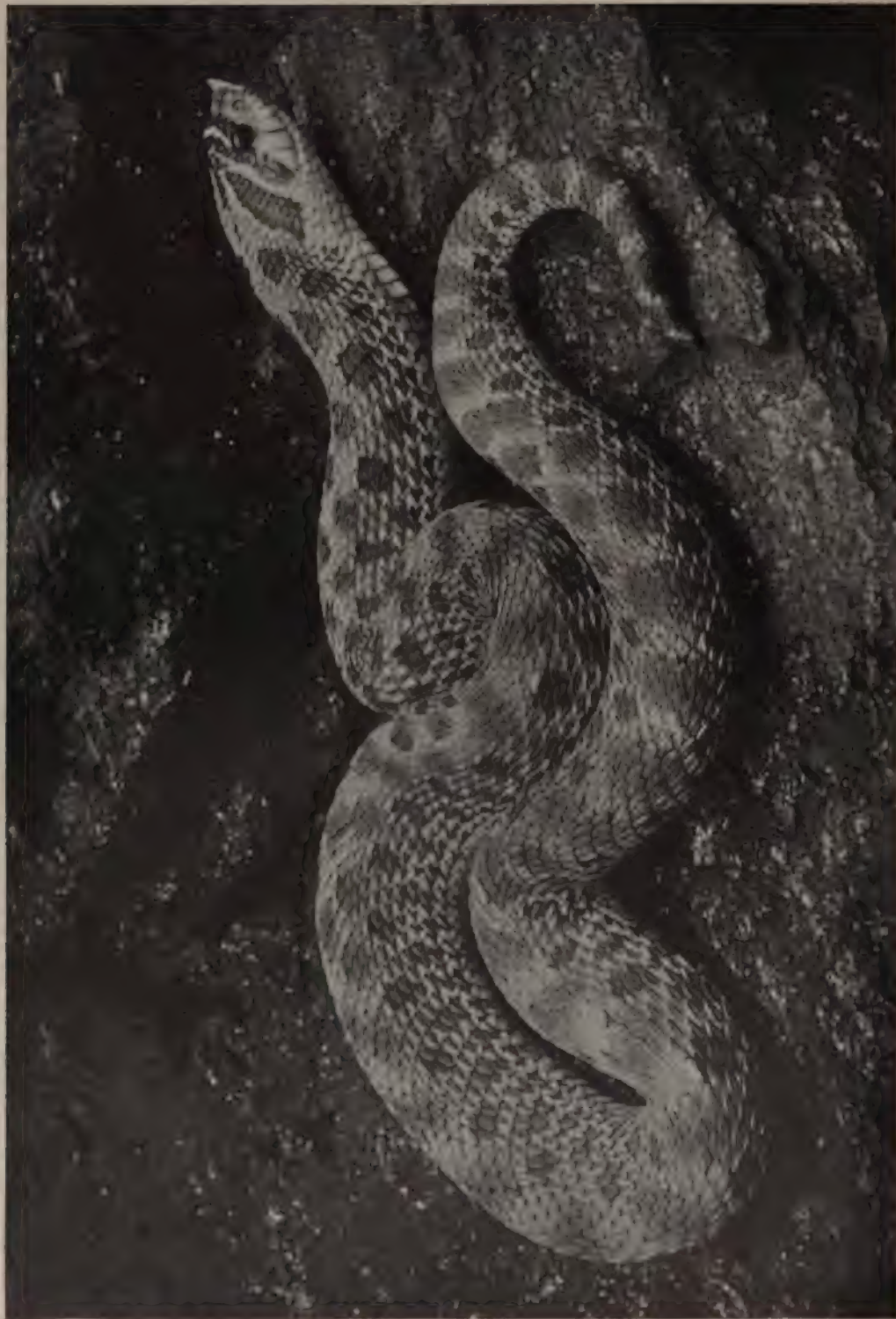
THE WESTERN HOG-NOSED SNAKE

Heterodon nasicus, (Baird & Girard)

The present species is most nearly allied to the Southern Hog-nosed Snake, though it is a larger reptile. With this snake.



SOUTHERN HOG-NOSED SNAKE, *Heterodon simus*
A smaller and stouter species than *H. platyrhincus*, while the snout turns up at a sharper angle



WESTERN HOG-NOSED SNAKE, *Heterodon nasicus*
In the development of the snout this is the most remarkable of the Hog-nosed Snakes. It is also characteristic in having a broad black band on the centre of the abdomen

the characteristic snout, that so readily distinguishes species of the genus, is most strikingly developed.

Colouration.—By one character, the present species may at once be recognised from the closely allied *H. simus*. That is *presence of a wide area of black, covering the central portion of the abdomen*. The back is pale brown or yellowish, with a series of closely set, darker blotches on the back, and two rows of smaller, alternating blotches on the sides.

The head is much paler than the body and strongly marked with bands of rich brown, arranged thus: Two bands cross the top of the head; another extends from behind the eye to the angle of the mouth, while on each temple is a wide blotch or band of the same colour. Between these blotches is a short, dark bar.

Variations.—With many specimens the scales of the sides are white, with brown centres, while the back looks decidedly yellow and velvety, with but smoky traces of the large blotches. The upper row of blotches on the sides, however, is usually distinct, as are the head markings.

Dimensions.—Following are the measurements of a large specimen, from western Texas:

Total Length.....	23 $\frac{1}{2}$	inches.
Length of Tail	2 $\frac{1}{2}$	"
Greatest Diameter.....	$\frac{7}{8}$	"
Width of Head.....	$\frac{3}{4}$	"
Length of Head.....	1 $\frac{1}{16}$	"

Distribution.—Western United States and northern Mexico. The general range is extensive including Montana in the North, and the Dakotas. Eastward, the species ranges into Arkansas and westward into Arizona, thence into Sonora, Mexico. It does not occur in the Pacific region.

Habits.—The species is of less excitable disposition than the Eastern Hog-nosed Snakes. It can never be induced to bite, though it will sometimes bluff at doing so by striking with closed jaws at the object of annoyance. None of the writer's specimens could be induced to eat anything but toads, and of these, very small snakes would often engulf prey of extraordinary proportions as compared with the reptile's girth. Although a batrachian was often strong enough to drag the snake about with it, the toad was swallowed without what appeared to be undue exertion.

CHAPTER XLI: THE OPISTHOGLYPH SNAKES OF NORTH AMERICA

A Division of Mildly Poisonous Serpents, with Grooved Fangs in the Rear of the Upper Jaw—The Many Species Occur in Both the Eastern and the Western Hemispheres

Classification and Distribution.—The *Opisthoglyph* snakes form a division of the family *Colubridæ*. From the other members they are readily separated by the presence of a pair, or several pairs of *grooved teeth in the rear of the upper jaw*. These snakes are divided into three sub-families, seventy-nine genera and a very large number of species. But one of the sub-families is represented in the New World—the *Dipsadomorphinæ*, a few species of which occur in the southern portions of the United States. There are numerous species in Mexico, Central America and tropical South America, but the greater number inhabit Asia.

General Characters.—It is the popular idea that the poisonous serpent may generally be told by its thick body and wide, triangular head, and that a few venomous species of the New World—the Coral Snakes (*Elaps*)—resemble the harmless serpents in outlines but may be at once distinguished by their colouration. These conclusions are incorrect. As to the inconsistency of branding a snake as poisonous because it has a broad and flat, triangular head, the student is referred to the many species of thick-bodied, harmless serpents described and illustrated in the preceding pages. In regard to the idea of the Coral Snakes forming the few exceptions where venomous snakes resemble the slender-bodied, harmless species, the succeeding pages, dealing with the *Opisthoglyph* serpents, will be found to explain conditions quite to the contrary.

Aside from those snakes representing in North America the sub-family *Crotalinæ*—the Pit Vipers, and the sub-family *Elapinæ*—the Coral Snakes, there are various species of *poisonous* serpents. This is a condition not generally understood as the *Opisthoglyph* has either been classed as a group comprising

The Opisthoglyph Snakes of North America

inoffensive species, or its members designated as "suspects" owing to the presence of elongated, grooved teeth in the rear portion of the upper jaw. It should be understood that the *Opisthoglyph* snakes are distinctly poisonous. The grooved teeth are poison-conducting fangs, and connect with glands in the rear portion of the head. The fangs are ordinarily employed—as is the venom apparatus of all serpents—to subdue and to kill the prey, and not to use as weapons of aggression upon mankind.

The majority of these snakes are but mildly poisonous and consequently not dangerous to man in the effects of their bites. Moreover, if biting in self-defence, they do not generally employ their fangs as it is difficult for them to produce a wound with the venom-conducting teeth unless they take deliberate hold and advance the jaws in the familiar, chewing motion of snakes, thus bringing the grooved teeth into a position to be imbedded. Few snakes, unless grasped by the body, will use their jaws in this fashion. If cornered, they simply "strike." As the *Opisthoglyph* snakes are timid and active, accidents from them are very rare. However, persons have been bitten by these snakes, yet escaped being wounded by the fangs. Such observers have emphatically asserted that such snakes are innocuous and have thus set down their views in literature. There has consequently arisen a tangled argument about these creatures.

An examination of the teeth and a dissection of the head will remove all doubt as to the poisonous character of any of the species. The venom apparatus is, in fact, fully as perfect—though rather in miniature—as that of the much dreaded viperine snakes, but in place of the fangs being perforated and ejecting their venom from an orifice at the tip, they are grooved from the base to the tip. The accompanying figures, illustrating the structure of the fangs of various snakes, demonstrate the quite different dentition of these serpents from the better-known poisonous reptiles.

Though the writer has stated that most of the species occurring in North America are not liable to produce injuries actually formidable to man, wounds from the fangs of snakes belonging to the genera *Sibon* or *Trimorphodon*, would likely be followed by marked local symptoms.

The poison of the *Opisthoglyph* snakes appears to exert a powerful, benumbing influence upon the prey, which, when

The Opisthoglyph Snakes of North America

seized, is worked quickly backward into the mouth by alternate, grasping movements of the jaws, until the fangs are firmly imbedded, and in this position it is held until all struggles have ceased, when it is swallowed. The prey is generally benumbed and helpless within one or two minute's time. After a period of about five minutes it appears to be quite dead. The bitten creature seems to die with the muscles perfectly relaxed and in this condition is easily swallowed by the snake as the limbs fold readily against the body during the progress of the snake's jaws over it. To observe one of these snakes feeding is to appreciate the existence of an excellent development for the overpowering of the reptile's prey.

Though it has not hitherto been the custom, the writer without hesitation classes the *Opisthoglypha* among the *poisonous* snakes, and would advise the student to discriminate between living examples of these reptiles and the wholly innocuous snakes they so closely resemble.

An outline of the North American genera follows:*

I. Pupil elliptical.

Size moderate.

Body rather slender; head flat, wide and very distinct from the neck.

Colouration.—Pale, with darker blotches.

Two *loreal* plates.

Trimorphodon.

Distribution.—Southwestern United States; Mexico and Central America.

Conformation and colouration similar to preceding genus.

One *loreal* plate.

Sibon.

Distribution.—Texas, Mexico and Central America.

II. Pupil round.

Size small.

Body moderately slender. Head but slightly distinct. Pattern (of local species) in bands extending lengthwise.

Erythrolamprus.

Distribution.—Texas, Mexico, Central and South America.

Size very small.

Body moderately slender; head not distinct. Body brown; head blackish.

Tantilla.

Distribution.—Southern United States from South Carolina to California; Mexico, Central America and South America.

*The species of all the genera have *smooth* scales.

The Opisthoglyph Snakes of North America

The Genus *Trimorphodon*: This is essentially a Central American and Mexican genus. But one species ranges northward into the United States. All of the species are of moderate size—some reaching a length of a yard and the thickness of a man's forefinger. The neck is slender, but the head is broad, flat and very distinct, with large eyes, having a cat-like (elliptical) pupil. The species look like viperine, poisonous snakes and their temper is not of the best. The food consists of lizards, young snakes and batrachians—frogs and salamanders.

THE JEW'S-HARP SNAKE

Trimorphodon lyrophanes, (Cope)

Moderate in size—two and a half to three feet in length. Rather slender; neck very slender; head broad and very distinct—swollen at the temples, and with large eyes, the pupils elliptical.

Colouration.—Light gray; about twenty pairs of deep brown blotches on the back (to the base of tail); tail also blotched. There is an irregular row of blotches on the sides. Abdomen white; dark spots on the edges of many of the shields.

On the top of the head is a large patch of deep brown, its outlines suggesting those of a jew's-harp.

<i>Dimensions</i> .—Total Length.	30	inches.
Length of Tail.	6	"
Greatest Diameter.	$\frac{8}{8}$	"
Width of Head.	$\frac{7}{8}$	"
Length of Head.	$1\frac{1}{8}$	"

Distribution.—Southern Arizona; Lower California.

The Genus *Sibon*: Formation and size similar to the preceding genus, but there is a single *loreal* plate in place of two as existing with *Trimorphodon*. Seven species comprise this genus. They inhabit Mexico and Central America. One extends northward into southern Texas.

THE ANNULATED SNAKE

Sibon septentrionalis, (Kennicott)

Size moderate; body rather slender, the tail gradually tapering to a slender tip. Head very broad and distinct from neck; swollen at the temples. Eyes large, with elliptical pupil. Ventral plate divided—like the preceding species.

The Opisthoglyph Snakes of North America

Colouration.—Greenish-gray or yellowish above with large, black or brown blotches—six or eight scales long and extending downward nearly to the edges of the abdominal plates. Abdomen yellowish.

Across the rear part of the head is an obscure, pale band.

Dimensions.—Total length, 30 inches; tail about one-fifth the total length. The head is fully twice as wide as the diameter of the neck.

Distribution.—Southern portions of Texas, New Mexico and Arizona. Mexico generally and southward to Panama.

Habits.—A captive specimen, now living for several years, is persistently secretive, though it feeds readily. It spends most of the time in hiding under a flat stone in the cage or in a hollow it scoops in the gravel beneath the drinking pan. About the food, it is not particular, eating snakes, lizards, young mice and frogs. Among these creatures it takes the young snakes and frogs most readily. The species seems to be *oviparous*, as this snake laid a dozen eggs a few days after her arrival. They were deposited in a hollow she had scooped in the sand, under a flat stone.

The Genus *Erythrolamprus*: The species are smaller than those of the preceding genera; the body is rather slender and the head but slightly distinct. *Eyes with a round pupil*.

Six species are recognised. With the exception of one, they are confined to Mexico and Central America.

THE BLACK-BANDED SNAKE

Erythrolamprus imperialis, (Baird)

Small in size and with a rather slender body. The head is but slightly distinct from the neck. Ventral plate divided.

Colouration.—Pale brown; a black band on the back and a similar band on each side. Abdomen reddish; sometimes spotted.

A black-bordered, yellow line from the snout to the temple.

Dimensions.—Total length, 14 inches; tail, 6 inches.

Distribution.—Central America and Mexico, northward into southern Texas.

The Genus *Tantilla*—the Black-headed Snakes: In the number of species, *Tantilla* is a fairly large genus, but all of the

The Opisthoglyph Snakes of North America

members are of diminutive proportions. They inhabit the southern portions of the United States, Mexico, Central America and South America. Most of the species have a pale brown body and a black head.

The body is slender, with about fifteen rows of smooth, opalescent scales; the head is flat and not distinct from the neck. In front of the eye is a *single* plate (*preocular*). The loreal plate is lacking. (See Figure.)

These tiny serpents are provided with the usual dentition of the *Opisthoglyph* snakes—grooved fangs on the rear portion of the upper jaw, but may be classed among the reptiles innocuous to man as their microscopic teeth would be unable to draw blood.

The species of *Tantilla* lead a secretive, or burrowing life.

A concise list, only, is given of these serpents:

General Colouration.—Body brown; head blackish.

A. *Seven* upper lip plates (*superior labials*).

a. A yellow or white ring at base of head.

Yellow ring followed by a broader ring of black.

CROWNED SNAKE, *T. coronata*, (B. & G.)

Dimensions.—Length..... 9 inches.

Tail..... 1 ⁵/₈ "

Diameter..... ⁸/₁₆ "

Width of Head..... ⁸/₁₆ "

Length of Head..... ⁹/₃₂ "

Distribution.—Southeastern States. South Carolina to Florida (inclusive); westward to Mississippi.

Yellow ring bordered in rear by black dots.

EISEN'S BLACK-HEADED SNAKE, *T. eiseni*, (Stejneger.)

Distribution.—Seven specimens known; all captured twenty-five years ago, at Fresno, California.

b. No yellow ring at base of head.

TEXAS BLACK-HEADED SNAKE, *T. nigriceps*, (Kennicott).

Distribution.—Texas and New Mexico.

B. *Six* upper lip plates.

Colouration like the preceding species.

SLENDER BLACK-HEADED SNAKE, *T. gracilis*, (B. & G.)

Distribution.—Missouri to Texas.

Among these North American *Opisthoglyph* snakes, the species of *Trimorphodon* and *Sibon* alone, are actually dangerous. Fortunately, they are easy to recognise by the distinct head and cat-like eye. Compared with the other—degenerate—snakes of the kind inhabiting the United States, they are unique.

CHAPTER XLII: THE ELAPINE POISONOUS SNAKES

SUB-FAMILY ELAPINÆ

A Large Sub-family of the COLUBRIDÆ Embracing the Old World Cobras and Their Allies, and the American Coral Snakes—Résumé of the ELAPINÆ—Descriptions of the North American Species—Their Habits

Classification and Distribution.—With the exception of the Coral Snakes (genus *Elaps*), the Elapine snakes inhabit the Old World. This sub-family is composed of twenty-nine genera, which embrace about one hundred and forty species.

While the Elapine snakes occur abundantly in Africa, southern Asia and throughout the Malay Archipelago, they are most elaborately represented in Australia and New Guinea. Australia teems with these formidable reptiles which compose the serpent life of that great island, with the exception of a very few harmless species. The Black Snake (*Pseudechis porphyriacus*), the Tiger Snake (*Hoplocephalus curtus*), the Brown Snake (*Diemenia superciliosa*) and the Death Adder (*Acanthophis antartica*) are among the deadly snakes of the latter country. With the exception of the Death Adder, these species are very closely allied to the Cobras, and exhibit a tendency to dilate the neck into a "hood" when angered.

The largest species of the Elapine snakes are the Cobras, genus *Naja*, which inhabit southern Asia, the Malay Archipelago and Africa. The majority of these serpents, of which there are ten species, attain a length of six feet, and one species, the King Cobra (*N. bungarus*), grows to a length of twelve feet. Probably the most familiar example of the *Elapinae* is the Cobra-de-capello (*N. tripudians*) of southern Asia and Malaysia. This is the snake so frequently employed by the Hindoos in their exhibitions. Another well-known species is the Egyptian Cobra, or "Asp" (*N. baje*), alleged by historians to have been used in the suicide of Cleopatra. When annoyed, the majority of the Cobras rear the forward portion of the body from the ground, and dilate the

neck broadly, thus producing the familiar "hood." The skin is spread by a number of movable ribs, which lie against the backbone when the snake is in a passive mood.

The American Elapine serpents—the Coral Snakes—although structurally related to the deadly and vivacious Cobras and their allies, are rather degenerate reptiles, of considerably smaller proportions. All evince burrowing habits, and the greater number of the species occur in tropical South America and Central America.

Anatomy of the Elapine Snakes.—From a structural standpoint, with the exception of the teeth, the Elapine serpents are exactly like the typical harmless snakes—sub-family *Colubrinae*. The majority of the species are slender of body, with a rather narrow head. A Cobra, when in a passive mood, exhibits much the same outlines as the harmless Gopher Snake (*Spilotes corais couperi*) of the southern United States. Compare heads (figured) of the coral snakes with those of the harmless species. Hence the beginner must again make careful note that *all poisonous snakes—and in fact some of the most deadly known species—cannot be distinguished by the possession of a "broad, triangular head."* That rule applies to the viperine snakes, but is by no means infallible in separating the latter from many of the thick-bodied innocuous species.

With a thorough technical knowledge of snakes, this involving their scalation and distribution, the Elapine snakes may be generally recognised upon a hasty examination of their external characters. With most of the species a certain plate on each side of the head—the *loreal*—is lacking. This plate is to be found with the greater number of the harmless colubrine snakes. Its position is indicated on the heads figured.

An examination of a skeleton head of one of these reptiles at once shows the reason for giving the Elapine serpents a distinct place in classification. On the front portion of the upper jaw bones is a pair of short, stout fangs that are rigid in their position—that is, they do not fold against the roof of the mouth as do the long fangs of the viperine snakes. On the front surface of these fangs is a distinct groove. In fact these snakes have been described as possessing "*grooved*" fangs. This term, however, is misleading and might tend to bring about the idea that the structure of the fangs is the same as that displayed with the dentition of the *Opisthoglypb* snakes—previously

The Elapine Poisonous Snakes

considered. Such is not the case. Although the face of the fang is deeply furrowed, the venom-conducting teeth contain a canal for the flow of poison and open in a small orifice at the tip, in the same fashion as a hypodermic needle. To be more detailed in this explanation it might be said that the Elapine snakes stand midway between the *Opisthoglyph* serpents and the Vipers, as regards the development of the fangs. With the *Opisthoglypha* the venom is conducted down the fangs by a *groove*; with the *Elapinae* (or *Proteroglypha*) the tooth is folded over the groove, forming a canal, yet leaving the former very apparent in the process of evolution, while the viperine snakes possess fangs of the most perfect development, though on the front of each is a faint indication of the groove.

Compared with the fangs of the viperine snakes, the poisonous instruments of the Elapine serpents are very small. While the fangs of a seven-foot rattlesnake are nearly an inch in length, the poison-conducting teeth of a twelve-foot King Cobra—the *most deadly of all snakes*—are but five-sixteenths of an inch in length—but the poison of the *Elapinae* attacks the nerves and does not require injection to any depth before beginning its fatal work.

The American Elapine Serpents

The Coral Snakes—genus *Elaps*: These snakes have derived their popular title from the bright, coral red, arranged in broad rings on many of the species. With the majority of the Coral Snakes, the pattern consists of broad rings of red and black, and narrow rings of yellow.

The Coral Snakes are of moderate size, with a cylindrical body, rather short tail, and blunt head not distinct from the neck. The eyes are very small and bead-like. With all of the species the scales are smooth, highly polished and opalescent. The brilliant colours, combined with the lustre of the scales cause these reptiles to be among the most beautiful of the snakes. As captives, however, they are uninteresting, continually endeavouring to burrow away from the light and displaying a decided indifference toward feeding.

Of the total number of Coral Snakes—about twenty-eight species—but two occur in the United States. The majority inhabit tropical South America. In the latter country they

The Elapine Poisonous Snakes

attain a fair size. *Elaps marcgravii*, *E. corallinus* and *E. surinamensis* attain a length of four and five feet and their bites, with man, are usually followed by speedy death. The various species display subterraneous habits, for which they are structurally well-fitted, owing to their cylindrical form, but are frequently found wandering above ground. All of the species are cannibalistic, feeding upon the smaller species of harmless snakes and upon lizards.

Before entering upon descriptions of the North American species, the student should understand that there are several innocuous serpents in our Southern States that closely "mimic" the Coral Snakes in colouration, form and size. Moreover, these reptiles are to be found in much the same situations as the poisonous species. Their pattern is a brilliant combination of red, yellow and black rings, or ring-like blotches. They are frequently mistaken for Coral Snakes and as such are slain. But it is interesting and rather startling to explain that the venomous reptiles are as often mistaken for the harmless ones, and carelessly handled.

Among the harmless snakes that are apt to confuse the student, are the following species:

LeConte's Snake,	<i>Rhinocbilus lecontei</i> .	} Southwestern U. S.
Arizona King Snake,	<i>Opibolus zonatus</i> .	
Western Milk Snake,	" <i>doliatus gentilis</i> .	
Milk Snake,	" "	} Southeastern U. S.
Dwarf King Snake,	" <i>coccineus</i> .	
Scarlet Snake,	<i>Cemophora coccinea</i> .	

All of the species quoted have much the same colours as the North American Coral Snakes, either in rings, completely encircling the body, or in a semi-ringed fashion above. Yet the disposition of these rings is different from that of *Elaps* and, once understood, will greatly aid the student in immediately distinguishing the dangerous from the harmless reptiles.

With the species of *Elaps*, the black rings are bordered on each side by the yellow ones. With the harmless snakes, the yellow rings are bordered on each side by the black.

Another important point to remember is that with the Coral Snakes the bands of colour completely encircle the body. With several of the non-venomous imitators mentioned, the similarity to *Elaps*, from above, is very striking, but the abdomen is either uniform white or is blotched.

The Elapine Poisonous Snakes

The North American Coral Snakes may be readily separated from one another by the arrangement of the colours, as seen by the following formula:

General Pattern.—Broad red and black rings; narrower yellow rings.

Snout black; a broad yellow band across centre of head and behind this a *black* ring.

Yellow rings of body very narrow.

HARLEQUIN SNAKE; CORAL SNAKE, *E. fulvius*.

Distribution.—North Carolina to southern Mexico.

Greater portion of head black; a yellow band on back of head and behind this a *red* ring.

Yellow rings on body rather broad.

SONORA CORAL SNAKE, *E. euryxanthus*.

Distribution.—Arizona; northern Mexico.

Detailed descriptions of the species, with notes upon their habits, are herewith given.

THE HARLEQUIN SNAKE; CORAL SNAKE

Elaps fulvius (Linn.)

It is owing to the striking colouration that the name of Harlequin Snake has been given to this species, which is rather slender and seldom attains a length of more than a yard. The head is flat, very blunt, and not distinct from the neck.

Colouration.—The pattern consists of broad rings of deep scarlet and blue-black, separated by narrow rings of yellow. The snout is black and a wide band of yellow crosses the middle of the head; behind this is the first black ring of the body pattern.

The red and the black rings of the body are from seven to twelve scales wide; the yellow rings exhibit a width of from one to two scales. On the back the red rings usually contain spots and patches of black; beneath, they are generally uniform red with the exception of a large blotch of black in the centre of the abdomen.

The tail contains none of the red rings, being black with broad rings of yellow.

Variations.—In the United States this species is fairly constant in pattern, although with some specimens the crimson rings are so suffused with spots and blotches of black as to impart a decidedly dull appearance in comparison with individuals on which the red is vividly apparent.

The Elapine Poisonous Snakes

Mexican specimens display marked variations of pattern. The black rings are rather narrow and the red rings very wide—from two to three times the width of the black rings. With such specimens the yellow rings are merely represented by a tinge of that colour upon the tips of single scales bordering the black areas. It is quite possible that a large series of Mexican specimens would prove these reptiles to be worthy of a distinct, varietal name. An illustration is presented of a typical specimen from Marion County, Florida.

Colours of Young Specimens.—The pattern of the young is precisely like that of the parent, though the colours are paler. The red rings are represented by a pale brick colour. (Illustrated.)

Dimensions.—The largest specimen examined, from the United States, was 37 inches in length. This is considerably above the average for specimens north of Mexico. The measurements of an average-sized adult from Gainesville, Florida, are given:

Total Length.....	28½ inches.
Length of Tail	2½ "
Greatest Diameter.....	½ "
Width of Head. . . ,	⅞ "
Length of Head.....	¾ "

A freshly hatched specimen measured 7½ inches in length and one-eighth of an inch in diameter at the thickest part of the body.

Distribution.—The species ranges from northern North Carolina to the Gulf of Mexico, westward through Texas, thence southward into Central America. It has extended its distribution up the Mississippi Valley as far north as southern Ohio, where occasional specimens are found.

Habits of the Coral Snake

Much has been written about the alleged inoffensive habits of this snake. By some writers it is described as mildly poisonous, and quoting Prof. E. D. Cope, "innocuous to man and the larger animals," which information is intended to convey the impression that the Coral Snake is too small to be deadly to anything but the small creatures that constitute its food.

Slender and brightly coloured, with a small, harmless

The Elapine Poisonous Snakes

appearing head, this pretty creature is known to possess poisonous fangs, but from a theoretical standpoint the assumption is that a snake of such graceful appearance, with all the characteristic stamp of a venomous snake removed, is, if poisonous at all, very mildly so. This is the argument, and the writer has many times observed these attractively coloured reptiles handled in the most careless manner, and has been scoffed at for interfering for the good of the careless individual who would not believe.

The Coral Snake belongs to a sub-family that contains some of the most deadly known species of snakes. Among its near allies are the Cobra-de-capello, the Krait and the Australian Tiger Snake. All the snakes of this sub-family are noted for their resemblance to the harmless snakes, and though possessing very small poison fangs *are provided with a venom that is more deadly in effect than that of the thick-bodied vipers.*

It is owing to the fact of the Coral Snake possessing very short fangs that some scientists, who have made detailed examinations of alcoholic specimens, have pronounced their verdict—"poisonous, but very slightly so." It might be well for these writers to appreciate *that the fangs of the Coral Snake are slightly larger in proportion to the reptile's size than those of the acknowledged deadly Cobra, and that the former reptile secretes a venom more powerful than that of the rattlesnake.*

Thus, in spite of its pretty colours and alleged "docile nature," the writer feels that this serpent should be described as it really is. It should be placed in the list of dangerously poisonous snakes—given rank in point of deadliness with the long-fanged vipers, in comparison with which its poisonous characters have been scoffed at.

During many years, the writer has examined several hundred specimens of this snake and at no time has been able to note any particular degree of docility. It is true that a serpent of this kind may be handled without accident, as its actions in biting are quite different from many snakes. Nevertheless, the danger is great in handling it. It might be incidentally explained that the rattlesnake, the copperhead and the moccasin might likewise be handled after the fever of anger attending their capture has passed. Such has been the case with many reckless men who style themselves "rattlesnake charmers," and the like. When first disturbed in their native wilds, these latter, thick-bodied

The Elapine Poisonous Snakes

serpents are more emphatic in their declarations of anger, while the Coral Snake, rather sluggish in attitude, may be mistaken in its demeanour to be "good natured." It should be explained that the rattlesnakes and their allies usually become quite tame as captives, when they will submit to being handled with apparent good nature.

The Coral Snake differs from crotaline* snakes in seldom or never *striking* at the object of its anger. If cornered it will lie sullenly motionless, or throw its body into a series of irregular loops, under which the head is often hidden. If unduly annoyed the reptile behaves in a peculiar manner. It twists from side to side, lying motionless for a few seconds, then throwing itself into a different position. The movements are jerky and erratic and seemingly without purpose. Then the reptile is treacherous and dangerous. Its movements are lightning-like and quite different from those displayed by the majority of snakes. If touched lightly upon the side, the small head is swung around and the jaws grasp the offending object, when the serpent *chews* until the small but formidable fangs have been imbedded a number of times.

In unpacking freshly captured specimens, the writer has frequently seen them turn and bite with the rapidity of a steel spring suddenly released from tension. This act of biting is unattended by any sign of warning. It may be caused by the simple touch of a stick against the snake's body. The amount of venom yielded at such times is a mute illustration of the creature's power of doing damage. A moment previous to this exhibition, the snake may be perfectly motionless and in an apparent state of lethargy. Thus does the Coral Snake defend itself with a poison which resembles that of the Cobra-de-capello. Surely it would not be appropriate, after noting such observations, to describe this snake as "mildly poisonous" or "innocuous to man and the larger animals."

Like all of the snakes representing the genus *Elaps*, the Coral Snake is of burrowing habits. It is sometimes found hiding under the bark of decaying logs, and is often exhumed in ploughing. After heavy showers and at night it issues forth in search of food, which consists of snakes and lizards. The species is very

*Comprehensive title for the sub-family to which the rattlesnake, copperhead, moccasin and allies belong.

The Elapine Poisonous Snakes

fond of the blue-tailed lizard (*Eumeces*) and finds them without trouble as they creep under the loose bark of logs and fallen timber for the night.

In captivity, the Coral Snake invariably dies within a few weeks if denied a situation that permits it burrowing and hiding for the greater part of the time. It may be kept successfully by giving it a case provided with several inches depth of *sphagnum* moss; but it is delicate and, unless kept in a temperature of seventy-five degrees Fahrenheit or over, will persistently refuse food. Experiments were conducted in the reptile house for several years with a view of producing quarters where this interesting snake could be placed on exhibition to be *seen*, and yet to partially favour its subterranean habits. When placed on thin layers of moss and sand it continually burrowed for a place to hide and refused all food. Specimens in cases well filled with moss, lived and thrived, but were never seen by visitors. Finding it practically impossible to strike the happy medium, a few specimens are kept on hand to be uncovered occasionally for the benefit of students, but the idea of an exhibition cage has for some time been abandoned.

When feeding, this snake displays a ferocity and snappiness of motion quite contrary to its generally sluggish disposition. If the prey be a snake, it is quickly seized by the neck or body and the fangs advanced in a series of chewing movements. At the beginning, this operation injects considerable venom and prepares the prey for the swallowing process. Working its fangs along the body of the fated creature, the snake shifts its victim into a position whence it may be swallowed head first. Frequently the quarry defends itself vigorously, biting the body of its foe and twisting itself about in a manner calculated to worry the enemy and release the grip of the relentless jaws. To these struggles, the poisonous snake pays little attention unless they become especially energetic, when it makes another series of wounds with the fangs, biting with a jerky, side movement, with the evident view of imbedding the venom-conducting teeth as deeply as possible. The fight is of short duration, for the prey is soon benumbed, when the limp body is engulfed at leisure.

The Coral Snake is oviparous. Its eggs are very elongate and are deposited in decaying bark or damp soil. A large specimen in the writer's collection laid seven eggs on the 29th of June.



CROWNED SNAKE, *Tantilla coronata*

Its body is very slender, and its head is very small. It is a very harmless snake, and its bite is not dangerous to man. It bites quickly paralyze earthworms and insect larvae.



Head of *Tantilla gracilis* (Enlarged)



A persistent burrower. With many specimens the top of the head is jet black and the abdomen bright red. The illustration is life size.

ANNULATED SNAKE, *Sibon septentrionale*

This Western snake has short, stout fangs in the rear of the upper jaw. Its bite quickly paralyzes small mammals and reptiles and it should be rated as a reptile dangerous to man, though not a deadly one.



2

1 and 2 HEAD OF HARLEQUIN SNAKE, *Elaps fulvius*.3 and 4 HEAD OF SONORA CORAL SNAKE, *E. caryocottus*

1 Top.

2 Side.

3 Side.

4 Top.

Belonging to the subfamily *Elapidae*, the Coral Snakes are allied to the cobras of the Old World. They have a pair of short, permanently erect fangs on the forward part of the upper jaw. Their bites often prove fatal to man. Many species are found in Central and South America.

The Elapine Poisonous Snakes

One of them was opened and found to contain a translucent embryo about two inches in length. The remainder were placed in damp wood pulp in the temperature of an ordinary living-room. From the batch another was opened on the 6th of August. It contained a white and perfectly formed embryo, $5\frac{1}{4}$ inches long, showing the scalation to be well formed, but without trace of pattern. The specimen was translucent and when held to the light, the heart, performing its pulsations, could be clearly seen. The five remaining eggs hatched between the 26th and 28th of September. The young were about 7 inches long and one-eighth of an inch in thickness. They were very active, and when removed from the hatching tray with a pair of forceps, grasped the steel tips in an endeavour to use their diminutive fangs.

THE SONORA CORAL SNAKE

Elaps euryxanthus, (Kennicott)

The size is smaller than that of the preceding species. The tail is short and blunt.

Colouration.—The general character of the pattern is quite distinct from that of the Harlequin Snake. The colours are disposed in rather broad rings of crimson or brick-red, and equally broad rings of black, which are separated by yellow rings. Compared with *E. fulvius*, however, the red and the black rings will be seen to be proportionately narrower and the yellow rings much broader. On the forward portion of the body, above, the red rings are very narrowly edged with black. They contain no black spots or blotches as do the red areas on the allied species.

The forward portion of the head is black. On the back of the head is a broad band of yellow, followed by the first red ring of the body pattern. The latter character at once distinguishes this species from the Harlequin Snake.

There are three broad black rings on the tail, separated by narrower ones of yellow.

Dimensions.—The only specimen of this rare snake available to the writer for measurement, has not attained its full size, but the figures given well demonstrate the general proportions:

The Elapine Poisonous Snakes

Total Length.....	15 inches.
Length of Tail.....	$1\frac{1}{8}$ "
Greatest Diameter.....	$\frac{5}{8}$ "
Width of Head.....	$\frac{1}{4}$ "
Length of Head.....	$\frac{3}{8}$ "

Distribution.—Central and southern Arizona and Sonora, Mexico.



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HARLEQUIN SNAKE - CORAL SNAKE, *Elaps fulvus*.

Several of the harmless snakes look much like this beautiful and dangerous little creature. It should be noted that the yellow rings border the black, a condition reversed among the non-venomous serpents with similar colours. The Coral Snake is a burrowing species, often ploughed up in the fields—yet it is sometimes found wandering on the surface. Its food consists of small snakes and lizards. The habitat includes the Southern States and Mexico.



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SONORAN CORAL SNAKE *Elaps curysanthus*.

A little known species of the Southwest and northern Mexico.

CHAPTER XLIII: THE VIPERINE SNAKES

FAMILY VIPERIDÆ

The Thick-bodied Poisonous Snakes of the New World—Serpents Distinguished by Their Long Fangs, which Fold Against the Roof of the Mouth when it is Closed

Classification and Distribution.—The family *Viperidæ* is of moderate size. It is composed of about one hundred and twenty-five species, representing thirteen genera. The species are scattered over the temperate and tropical portions of both the Eastern and the Western Hemispheres. The *Viperidæ* is divided into two sub-families, these technically termed the *Viperinæ* (the True Vipers), the species of which are found only in the Old World, and the *Crotalinæ*, or "Pit Vipers," occurring in both the Old and the New World, but attaining their greatest size and variability of form in the latter. Thus, in North America, all of the thick-bodied poisonous snakes are "Pit Vipers" or *Crotaline* serpents. The members of both sub-families may be recognised by the flat triangular head, very distinct from the neck and the elliptical (cat-like) pupil of the eye. The top of the head, with the majority of the species, is covered with very small, granular scales. Some show regularly arranged head shields of much the same formation and character as those of the colubrine snakes.

The Pit Vipers: The sub-family *Crotalinæ*, containing the rattlesnakes, the copperhead snake, the moccasin and the "fer-de-lance" has acquired the popular title for its members—the Pit Vipers—owing to a peculiar development seen with all the species. This consists of a deep pit, situated between the eye and the nostril. The orifice is lined with a delicate epidermis and connects with a well-developed nerve extending backward to the brain. That this pit is of some use to the snake, seems very probable, when the attendant nerve development is considered. Many investigations have been attempted, with the result of complicated anatomical repetitions in the line of description, but

The Viperine Snakes

with no actual proof of the function of this organ. Nor do observations of living snakes aid in solving the problem. It is intimated by some scientists that the "pit" is an organ of hearing, but there is little to back this assertion. The Pit Vipers possess the same rudimentary, internal ears as do other snakes, and evince no superiority in distinguishing sound over serpents observed generally. Dr. Leonhard Stejneger, Curator of Reptiles in the United States National Museum, favours the idea of a sixth sense, in relation to the Pit, and explains that man may never comprehend the nature of a sense which he himself does not possess.

Dissection reveals the Pit to be more complicated than seen by external examination. It extends backward toward the eye and widens into a second opening, close to the eye-ball. A horse-hair inserted close to the forward portion of the eye-ball will appear through the large opening between the eye and the nostril. Suffice it to say with these few words of explanation, that the object of the Pit of the *Crotalinae*, remains to be discovered, but in identification, it serves as a constant and valuable guide.

The poison apparatus of the Crotaline snakes consists of two long and hollow teeth—fangs—provided with an elongated orifice at their tips for the ejection of venom. These fangs are the exact reproduction, in hard enamel, of the hypodermic needle. It might more appropriately be said, that mankind in manufacturing the hypodermic needle exactly duplicated the poison fangs of these reptiles. The fangs are rigidly fastened to a *movable bone* of the upper jaw, and each connects with a gland, situated behind the eye, and containing the venom. When the jaws are closed, the fangs fold back against the roof of the mouth. As the jaws are opened, they spring forward, ready for action. The forcible ejection of venom from the fangs is caused by the contraction against the glands, of the muscles which close the jaws. The ejection of poison is voluntary, and unless the reptile so desires there is no necessity in closing the jaws, to contract these muscles sufficiently to force venom from the glands. The fangs are covered with a sheath of thin and white, membranous flesh. This is never withdrawn from them except during the act of biting. A figure shows the fangs uncovered as would be the case after being imbedded, during a bite; an accompanying illus-

The Viperine Snakes

tration shows the fangs covered with the membrane. Thus they are seen when a poisonous snake is yawning.

The fangs are shed at intervals of about three months apart, and by a neat provision of Nature the new fang grows into place *beside* the one about to be shed and becomes connected with the poison gland, before the old fang becomes loosened. The writer has examined many specimens possessing two perfectly developed fangs on one side of the jaw. The old fang is shed by being left imbedded in the body of the prey that is bitten by the snake and is consequently swallowed with the prey. So hard is its composition that, although the bones, claws and even the teeth of the engulfed animal are entirely dissolved, the swallowed fang is unaffected by the action of the gastric juices. In a figure showing an osteological preparation, the growth of auxiliary fangs may be seen behind the acting pair. This constant renewing of the fangs explodes the common supposition that a poisonous snake may be rendered harmless by removing its fangs. Though the main pair of fangs be removed the snake is not rendered even temporarily harmless, for poison is discharged in the act of biting from the base of the extracted fangs and the small teeth of the upper jaw, employed normally by the snake in swallowing its prey, would produce lacerations through which the venom would come in contact with the blood.

As previously explained, the fangs themselves are not movable, but are rigidly attached to movable bones. In the act of striking, the jaws are opened to such an extent and the fangs so elevated that their tips point almost directly forward. In striking toward a perpendicular surface the serpent literally *stabs* with these teeth and instantly draws back to the position of defence. If striking toward a rounded surface or a small object, the jaws close upon it enough to imbed the fangs, but so lightning-like is this motion that the movements of the jaws can barely be followed by the human eye. The mouth is not opened until the head has started forward, and it is during the latter part of the blow that the jaws are thrown open to the extent described.

At most, the snake strikes about one-half its length when delivering an accurately aimed blow, and generally strikes a much shorter distance, in proportion to its length. Not unless goaded into a condition of frenzy does it strike a distance equal to two-

The Viperine Snakes

thirds of the length, and such blows are wild, and delivered aimlessly. *No poisonous snake springs bodily at the object of its anger*; such a feat with a serpent is physically impossible. The defensive methods of the numerous North American species will be discussed in the respective descriptions of the species.

In this work, it would be inappropriate to tarry and discuss at length the investigations concerning the composition of snake poison. It is important, however, to consider the best known remedies for snake-bite, and thus suggest what actions should be taken in case of accident.

Remedies for Snake-bite.—Against the action of the subtle fluid mankind has battled in the search for an "antidote," and many are the alleged cures for "snake-bite," though few are the actually useful chemicals known in case of catastrophe with human kind. The administration of large doses of whiskey is not only useless but exceedingly harmful. In *small* doses, whiskey is a valuable stimulant and combats the paralyzing action of the venom. In large doses it stimulates but briefly, and then benumbs the faculties, reducing the system to a condition most susceptible to the action of the poison. It is a bold assertion, but nevertheless true, that the majority of so-called cures by the whiskey method have been but "recoveries," by frightened individuals, from the bites of *harmless* snakes. The writer remembers an interesting instance in South Carolina, when a powerful Negro was bitten on the thumb by a copper-bellied "moccasin" (the harmless, red-bellied water snake), which is reputed to be a rival in deadliness of the dreaded "cotton-mouth." The man had started to kill the snake and becoming bold attempted to pick the reptile up by the tail and "snap its head off." The snake yet possessed sufficient life to turn and grasp his finger. The result was several punctures from the needle-like teeth. In a hysterical condition the Negro was led to the village, where his feelings were somewhat relieved by the assurances of the wise ones that they had heard of cases where the bite of *that same species of snake* had been cured by the administration of large quantities of whiskey. The Negro drank enough liquor to intoxicate half a dozen men, but was so excited that his head remained clear and he continually re-told the snake's fiendish attack upon his life. Later in the day he became drowsy and after prolonged slumber awoke to explain that his life had

been saved. The news travelled rapidly and the value of whiskey for snake-bite was much exploited in the district.

It is of interest to review, from a simple and practical standpoint, the best treatment in case of accident. First, of importance, is to shut off the flow of blood from the vicinity of the wound, and prevent the venom attaining access to the general system. If the wound be upon the arm or leg, as it almost invariably is, this is quickly effected by the application of a ligature; a rubber ligature is the most convenient, and best in result. With the flow of blood shut off the next step is to enlarge the punctures made by the fangs in an endeavour to drain away the surrounding, poisoned blood. This treatment is of course heroic, but should be performed *thoroughly* and without hesitation. A very sharp knife or a razor should be used. Incisions slightly deeper than those made by the fangs should be made directly across the primary wound and about an inch in length. If the bite is from a very large snake the incisions should be larger. The flow of blood from these drainage cuts should be hastened by suction from the mouth, after which the wounds should be thoroughly washed out with a solution of *permanganate of potash* (enough of the crystals in water to produce a deep wine colour). While these precautions are being taken, *send for a good surgeon*. In many instances of snake-bite, surgical attendance is not within calling distance. If such be the situation, several things must be done, and carefully.

The ligature should be removed, but not until the drainage cuts have been thoroughly bled and washed to their depths with the solution of permanganate of potash, the action of which oxidizes and thus destroys what poison with which it comes in contact. With the ligature removed small doses of whiskey should be taken, to stimulate; alarming symptoms—fainting spells—should be met with hypodermic doses of strychnine, which is a powerful stimulant. The wounds themselves should be carefully covered with *wet*, antiseptic dressing, small strips of which should be packed into the drainage incisions to keep them open and induce further drainage of poisoned blood.

The important fact should be understood *that an arm or leg bitten by a poisonous snake is very susceptible to common blood-poisoning (septicæmia), owing to the deadening effect which the venom produces upon the organisms in the blood that combat germ*

The Viperine Snakes

life. The effect of such a complication as blood-poisoning upon a system weakened by the primary ordeal, may be imagined.

To conclude this subject the writer ventures to prepare a list of articles which should be taken by those who venture into districts where poisonous snakes may be dangerously numerous. A complete outfit to be used in case of accident may be carried in very small space, and the articles needed would be:

Several good (very sharp) scalpels or lancets.

A rubber ligature.

A hypodermic syringe of fair size.

A package of absorbent cotton.

Several yards of aseptic gauze.

A few ounces of permanganate of potash (crystals).

A small quantity of some concentrated antiseptic solution, and there are many of such.

Several sealed tubes of anti-venomous serum.

This constitutes a fairly complete outfit that can be used by any man of practical ideas. The majority of the articles mentioned should be among the effects of every man that travels, in case of various every-day accidents. At this point it is important to describe the serum treatment of snake-bite—the necessary article being included in the list.

The serum is obtained from animals that have been immunised by the repeated injections of snake venom—in fact, procured along the same lines as the anti-toxins for various diseases. It is hypodermically injected, not in the region of the injury, but in some portion of the body where the circulation will quickly take it up and distribute it—preferably under the skin of the abdomen. Its action is to fortify the system against the poison and experimentation has yielded excellent results. The serum is the product of the Pasteur Institute, in Lille, France, where it is prepared under the direction of Dr. Albert Calmette.

To one leaving civilisation behind him, the writer begs to offer the following suggestions: 1st. See that you have all the necessary articles with you. 2d. Do not start out until after you have fully satisfied yourself that you are provided with good and well-digested advice from a surgeon. 3d. If you are bitten send for a doctor at once if he be within reach, or go to him if railroad, boat or horse will take you there. Above all,

keep your senses, for your life may depend upon your calm reasoning.

Records of Snake Bites.—Considering the number of species of poisonous serpents inhabiting the United States, some of which are abundant, some very deadly, the amount of casualties resulting from the bites of these reptiles is very small. Of these the majority result from the reckless handling of *captive* specimens.

The writer can recall two records of speedy death following the bite of the large Southern Rattlesnake (the Diamond-back). One involved a young Englishman, who was quail-hunting in Florida. About to fire into a bevy of quail, he was alarmed by the ominous whirl of a snake. Involuntarily stepping to the side, he was unfortunately too slow of movement. The guide was horrified to observe the dart of an olive head from the brush, and hear a cry of pain from his companion. The leg was tightly ligatured and within half an hour the man was being treated by a skilled surgeon from the North. Every precaution of draining and washing the injury—situated in the calf of the leg—was taken. Powerful stimulants were administered by the mouth and finally hypodermically, but in vain. Death, attended with great suffering, came within an hour after the serpent's stroke. Incidentally it may be added that the envenomed head that caused the tragedy was blown into atoms by both charges from the guide's shotgun. The other catastrophe was very similar and occurred in the northern part of the state.

Several records are at hand relating to the bites of the copperhead snake. In each instance there has been recovery, following intelligent medical attention.

Concerning the bites of captive poisonous snakes there are many records. The exploits of "Rattlesnake Jack"* are interesting and tragic. Hearing of the recklessness of this man the writer made his acquaintance, in New York, while the performer was filling an engagement at a dime museum. He was surprised at the audacity the man displayed in handling a collection of miscellaneous species of rattlesnakes, and asked to be permitted to inspect the creatures, thinking that their fangs had been removed, thus eliminating a certain proportion of the danger. He found the snakes to be in full possession of their fangs, a fact well demonstrated by the writer arranging to secure venom from

* John Sonwell.

The Viperine Snakes

the collection. These snakes yielded over a fluid ounce of poison, which was extracted by tying a piece of cheese-cloth over the top of an ordinary glass and applying the snake's jaws to the former, through which it bit fiercely, discharging two jets of venom into the glass itself.

A few weeks after the venom was extracted for study, from this collection of serpents, "Rattlesnake Jack" was bitten by one of the larger specimens—a Florida "Diamond-back"—of about six feet in length. The injury was upon the wrist, *from one fang*, and the man pluckily lanced it and bandaged the arm tightly. A half hour later the surgical staff of one of the larger hospitals was at work on the case. The poison had circulated up the arm, which swelled to a great size. *Eleven* drainage cuts were made and kept open with tubing. The swelling continued to extend over one side of the body, but persistence and skill were successful and the man went back to his dangerous work some months later. Several years after the writer again met the performer, who was recklessly exhibiting a writhing and rattling mass of Texas rattlesnakes.* After the "turn" he jokingly rolled up his sleeves to show "the good job done by the New York doctors."

The rattlesnake tamer humorously considered the writer's apprehension and laughingly handed him a souvenir of the place. A few days later came the news that "Rattlesnake Jack" was dead. He survived the bite of one of the big Texas rattlers but a few hours.

Generally speaking, reports are few and far between concerning fatalities from North American poisonous snakes in their native state, although it can be appreciated that the rattlesnakes rank among the most deadly of reptiles. Compared with the official figures, which show the death rate in India to be 22,000 a year from the bites of snakes, a great and very fortunate discrepancy is seen between the New and the Old World records. A logical explanation of this might be to the effect that in North America a large portion of the population does not evince a general inclination to go bare-legged through stretches of jungle as does the majority of the native population of India.

Herewith is given a tabulated list of the PitVipers—the *Crotalinae*—of North America, including all the species occurring

* *Crotalus atrox*.

The Viperine Snakes

north of Panama, and stating the areas in which they are found. The Mexican and Central American species are listed merely to demonstrate the variety of the New World Pit Vipers. They do not come within the scope of this work and are not considered in the succeeding chapters. Several additional species of *Lachesis* inhabit South America.

The list follows:

Genus *Ancistrodon*—The Moccasins.

Top of Head with large plates; scales keeled; tail ending in short spine.

Copperhead Snake, '*Ancistrodon contortrix*. *Habitat*.—Eastern and central United States—to Texas.
 Water Moccasin, "Cotton-Mouth," "*piscivorus*. " Southern United States—Florida to Texas.
 Mexican Moccasin, " "*bilineatus*. " Mexico and Central America.

Genus *Lachesis*—The "Lance-head" Vipers.

Top of head with small scales; body scales keeled; tail ending in a spine.

Bushmaster,	<i>Lachesis mutus</i> .	<i>Habitat</i> .—Central America; tropical South America.
"Fer-de-lance,"	" <i>lanceolatus</i> ."	" Mexico; Central America, W. Indies and So. Am.
" "	" <i>atrox</i> ."	" " " and South America.
Diamond-backed Lance-head,	" <i>nummifer</i> ."	" " " "
Godman's Lance-head Viper,	" <i>godmani</i> ."	Central America.
Lansberg's " "	" <i>lansbergi</i> ."	Mexico to tropical South America.
Horned Palm Viper,	" <i>undulatus</i> ."	Mexico.
Yellow-lined Palm Viper,	" <i>latratus</i> ."	Costa Rica.
Green Palm Viper,	" <i>bicolor</i> ."	Guatemala.
Schlegel's Palm Viper,	" <i>schlegelii</i> ."	Central America to tropical South America.
Green and Black Palm Viper,	" <i>nigroviridis</i> ."	Costa Rica.
Yellow-spotted Palm Viper,	" <i>aurifer</i> ."	Guatemala.

Genus *Sistrurus*—The Pigmy Rattlesnakes.

Size small; top of head with large plates; tail ending in a rattle.

Pigmy Rattlesnake,	<i>Sistrurus miliarius.</i>	<i>Habitat.</i> —Southeastern United States.
Massasauga,	" <i>catenatus.</i>	Central United States.
Western Massasauga,	" " <i>consors.</i>	Southwestern United States.
Mexican Ground Rattlesnake,	" <i>ravus.</i>	Mexico.

Genus *Crotalus*—The Rattlesnakes.

Size moderate to large; top of head with small scales; tail ending in a rattle.

4 South American Rattlesnake,	<i>Crotalus durissus.</i>	<i>Habitat,</i>	Mexico, Central America—tropical South America.
13 Gray Rattlesnake,	" <i>pulvis.</i>	"	Central America.
Mexican Rattlesnake,	" <i>triseriatus.</i>	"	Mexico.
Upland Rattlesnake,	" <i>polystictus.</i>	"	Tableland of Mexico.
Texas Rattlesnake,	" <i>atrox.</i>	"	Texas, Arizona and New Mexico.
Red Rattlesnake,	" " <i>ruber.</i>	"	Southern California; Lower California.
Prairie Rattlesnake,	" <i>confluentus.</i>	"	United States east of the Rockies.
Pacific Rattlesnake,	" <i>oregonus.</i>	"	Western United States—Pacific Region.
Dog-faced Rattlesnake,	" <i>molossus.</i>	"	Arizona, New Mexico, and northern Mexico.
Price's Rattlesnake,	" <i>tigris.</i>	"	Arizona.
Tiger Rattlesnake,	" <i>tigris.</i>	"	Southwestern United States.
Horned Rattlesnake,	" <i>cerastes.</i>	"	Deserts of the southwestern United States.
Green Rattlesnake,	" <i>lepidus.</i>	"	Southwestern United States.
White Rattlesnake,	" <i>mitchelli.</i>	"	Deserts of the southwestern United States.
Banded or Timber Rattlesnake,	" <i>horridus.</i>	"	Eastern and central United States.
Diamond-back Rattlesnake,	" <i>adamanteus.</i>	"	Southeastern United States.

CHAPTER XLIV: THE MOCCASINS

GENUS ANCISTRODON

Descriptions of the Species—Their Habits

WITH this genus the student is referred to a small group of *Crotaline* snakes. Characteristic from the large shields on the top of the head, arranged in similar fashion to the head-plates of the harmless snakes. This character produces a general resemblance between the Moccasins, and many of the thick-bodied, harmless serpents with coarsely keeled scales—such as the Water Snakes, genus *Tropidonotus*. From such reptiles, however, the Moccasins may be readily distinguished by *the pit* between the eye and the nostril, and the elliptical pupil of the eye as compared to the round pupil of the innocuous serpents. By their head plates, the Moccasins appeal—among the Pit Vipers—to the Dwarf Rattlesnakes, genus *Sistrurus*.

The genus *Ancistrodon* is composed of ten species, seven of which inhabit Central Asia generally, though some also extend northward into Siberia, and others southward, through British India, Ceylon and Java. One of the species occurs in the Islands of Japan. The remaining three species inhabit the New World. Two are confined to North America proper, while the third ranges from Mexico into Central America. Two of the New World species are semi-aquatic in habits. All are transversely banded, and thus in colouration resemble the non-venomous Water Snakes which are frequently confused with the poisonous reptiles and destroyed as such.

The Moccasins are highly venomous serpents. By some toxicologists their poison is considered to be more deadly than that of the dreaded rattlesnakes.

These serpents are *viviparous*—producing living young, but the broods are small and seldom exceed from seven to twelve. The markings of the young are very vivid; the latter portion of the tail is bright sulphur-yellow, which tint fades gradually

The Moccasins

as the serpent approaches maturity. From this character young snakes of the genus may be immediately recognised.

Following is a key to the New World species, relating to the pattern of the *adult reptile*:

a. *Pattern vivid*:

Pale brown; reddish brown cross-bands.

COPPERHEAD SNAKE, "HIGHLAND MOCCASIN," *A. contortrix*.

b. *Pattern obscure*:

Olive; wide, darker cross-bands.

WATER MOCCASIN, "COTTON-MOUTH," *A. piscivorus*.

Dark brown; darker cross-bands, bordered with yellow spots. MEXICAN MOCCASIN,* *A. bilineatus*.

Detailed descriptions of the species follow:

THE WATER MOCCASIN OR "COTTON-MOUTH" SNAKE

Ancistrodon piscivorus, (Lacépède)

Size large; form very stout. The head is very distinct from the neck. Scales of the body strongly keeled. On the under portion of the tail, for about the first two-thirds of its length, *the plates are in one row*; the remaining third is provided with two rows of plates, arranged as with the harmless snakes.

Colouration.—Dull olive or brownish above and paler on the sides, on which are indistinct, wide, blackish bands; these bands enclose areas of the ground-colour and dark blotches.

The upper lip plates are yellow, above which colour is a dark band from the eye to the angle of the mouth and above this a pale streak. The top of the head is very dark, usually black. The chin and lower lips are yellow with three dark bars on the lip plates, on each side of the mouth.

Abdomen yellow, blotched with dark brown or black—more so toward the tail, the under portion of which is black.

Variations of colour.—Young specimens are brilliantly coloured. They are usually of a pale reddish-brown, with bands of rich, dark brown. All of the bands and markings are narrowly edged with white, making the pattern vivid and striking.

Half-grown specimens are greenish, or chestnut brown, with very distinct bars, while very old specimens are generally

* Though included in the key, this species is not treated in the descriptive list. It occurs too far south to come within the scope of this work.

The Moccasins

of a uniform, dull olive brown or black, with little or no trace of the markings.

The very young specimens of this species somewhat resemble the young of the Copperhead Snake, but may generally be recognised by the situations in which they are found—the immediate vicinity of water.

In general conformation, pattern and actions, the Water Moccasin tallies with the popular idea of a poisonous snake. The body is very stout in proportion to the length, while the head is chunky and distinct from the neck. The large shields project slightly over the top of the eyes, imparting a sinister, scowling aspect; moreover, the tail tapers very abruptly from the body.

Dimensions.—The Water Moccasin is one of the largest of the poisonous serpents inhabiting the United States. It attains a length of five feet. Herewith are the measurements of a specimen of average size captured in Hampton County, South Carolina:

Total Length.....	4 feet.
Length of Tail.....	7½ inches.
Diameter of Body.....	2½ "
Width of Head.....	1½ "
Length of Head.....	2½ "

The largest specimen examined by the writer measured 58½ inches in length, and 9½ inches in circumference. It was captured at Lake Kerr, Marion County, Florida.

Distribution.—In the Atlantic Coast region, the Moccasin occurs from North Carolina, in the vicinity of the Neuse River, southward throughout Florida; thence it extends westward into eastern Texas. Its range northward is up the valley of the Mississippi into southern Illinois and Indiana. In those states bordering the Mississippi River proper and its lower tributaries, this snake is of general occurrence, although it is found in greatest numbers along swampy areas of the Atlantic seaboard and the Gulf of Mexico.

Habits of the Water Moccasin

In its native wilds the Water Moccasin is an irritable and pugnacious reptile. After being a short time in captivity it becomes tame, good-natured and lazy. Moreover it is very



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HEADS OF SERPENTS.

- 1 Skull of a harmless snake. The numerous teeth on the upper jaw are solid and rigid.
- 2 Head of a rattlesnake, showing the sheath that covers the fangs when they are not in use. The double fangs on one side in early shedding of one of these venom-conducting teeth. Observe the opening at the tip of each fang. It is from this the poison is secreted.
- 3 Skeleton head of a pit viper. The developing fangs may be seen behind the pair in use. A fully grown pair is ready to use. From this illustration it will be seen a poisonous snake cannot be rendered permanently harmless by extracting the functional fangs.



HEAD OF RATTLESNAKE

When the jaws are closed the fangs fold back against the roof of the mouth. They are exactly like the hypodermic needle—having an elongated orifice at their tip for the ejection of venom. The opening near the front of the lower jaw shows the location of the tongue-sheath. Thus it should be understood that the forked tongue is not a sting or in any way connected with the poison apparatus.



SKULL OF A PIT VIPER, SHOWING DEVELOPING FANGS

The illustration shows how fangs are constantly developing to take the place of the functional pair.

hardy, thriving for years in a captive state and breeding regularly if maintained under the proper conditions.

In the "lowgrounds" along the Savannah River the writer has found these serpents to be very common. They do not frequent the main body of water in any numbers, but are abundant in the adjoining swamps into which the river "backs up" during the heavy rains. In these swamps, as the river recedes, the water is left in numerous pools, entrapping large numbers of fish. Thus are the "Cotton-mouths" found, and in company with various species of harmless Water Snakes. They are commonly observed on the branches of bushes and trees that overhang the water, and if escape from danger be possible they quickly drop into the water, where they swim beneath the surface for some distance to emerge in some sheltered situation—among reeds or aquatic growth.

The writer remembers a hunt for these creatures in the Black Swamp, located in Hampton County, South Carolina. The swamp was circular, about five miles in circumference, and through it ran a curving stream of varying widths, spreading widely after the rains and filling numerous pools and bayous. The swamp contained a dense mass of cane-growth. In some parts the cane attained a height of eight feet.

On entering the swamp we followed the stream. Conditions were found to be in favour of snake-hunting. The stream was very low, owing to a drought, and in stretches here and there was little more than a series of pools, connected by trickling courses of water. The banks of these pools were sandy and progress into the swamp was comparatively easy in consequence. Not long after starting into the growth, we spied the first Moccasin. It was a large specimen, sunning on a log that projected from the water. This snake was stalked cautiously, and a noose, on the end of a very slim pole, was passed over its neck before it took alarm. The reptile was pulled quickly upon firm ground where its head was pinned down with a stick, when it was grasped by the neck and placed in a bag. In stepping over a fallen tree, the guide had a narrow escape. Coiled partially under the trunk was another Moccasin, which, suddenly surprised, drew back its head, opened its mouth and prepared to strike, but before it could do so the man leaped to safety.

This habit of the Moccasin, when surprised, of opening its

The Moccasins

mouth, with head drawn, and disclosing the white mouth-parts, has been responsible for the name of "cotton-mouth" snake, used in many parts of the South. After assuming this attitude, the snake shakes its tail vigorously, not with the rapid tremble of the rattlesnake, but in a slower, beating fashion, with much the same rhythm as the tapping of a woodpecker against a tree.

Several dozen Moccasins were observed during the course of the morning. It was noted that when these snakes were *suddenly* startled by our coming upon them after rounding thickets of cane or the like, they drew back their heads, opened their mouths, and glared in hostile fashion. Occasionally a snake would strike viciously, but after the first start of surprise, all endeavoured to glide away and escape. With one accord the snakes that observed us when some little distance away, made for the water and escaped, except for an occasional specimen that unwisely poked its head from the muddy water to see if danger was past. As they were noosed and grasped by the neck, they behaved like all poisonous snakes, in viciously resenting the familiarity.

Upon nearing the centre of this swamp, we found many pools that had dried. These contained large quantities of dead and shrivelled fish, while in the pools left by the uneven drying of the stream, living fish appeared to be very rare. This scarcity of food seemingly created an uneasiness among the harmless Water Snakes of the swamp which were found restlessly prowling. Indeed, many of them had left the swamp, and had wandered down the sandy roads along its borders. The appearance of several of these showy snakes on the nearby roads had primarily led the writer to believe that the swamp itself contained many, hence the exploration.

The drying up of the water appeared in no way to annoy the Moccasins. Some of them were found contentedly coiled on the borders of pools scarcely more than a yard in diameter. These latter snakes, finding it impossible to seek shelter in the water, glided among the roots of trees or among the canes. It was a specimen captured under such conditions that revealed, possibly, the reason for the apparent contentment of the Moccasins during the lack of fish, for as we caught him he disgorged two harmless Water Snakes, which had been consumed but a short time. It should be here understood that the Moccasin,



COPPERHEAD SNAKE, *Ancistrodon contortrix*—Common Phase
A very dangerous reptile of eastern North America. It grows to a length of three and a half feet



COPPERHEAD SNAKE, *Ancistrodon contortrix*—Texas Phase
In the extreme southern portion of the United States, the Copperhead Snake ranges as far westward as the Rio Grande River
The Western phase has fewer and much wider bands, while the adult has a pale greenish tail



HEADS OF COPPERHEAD SNAKE AND WATER MOCCASIN. From top and side



WATER MOCCASIN; "COTTON-MOUTH" SNAKE. *Ancistrodon piscivorus*

Abounds in the Southern swamps and lagoons. Its hostile looks are in perfect keeping with a constantly vicious disposition. The species is very poisonous. It feeds upon birds, small mammals and frogs.

The Moccasins

unlike the innocuous Water Snakes, does not confine its diet to cold-blooded prey, but feeds also upon birds and small mammals.

In captivity there are few or no reptiles more hardy than the Moccasin. The writer has specimens which have been captive for more than eleven years, and promise to flourish for an indefinite time. Some of these snakes were captive born and have grown to great size, owing to a regular supply of food and the absence of the hibernating period, which tends to limit a reptile's growth. These specimens never show the least intimations of hostility, and in fact the general demeanour of this species of snake when removed from a wild state is a lazy indifference to everything but food. They live well with no other water than contained in a small drinking dish, and usually congregate in social clusters with heads protruding in all directions from the mass of tangled bodies. With other snakes of equal, or even larger, size they are generally quarrelsome. Smaller snakes of other species are usually eaten, while many young Moccasins may be in the cage with the adults and escape all molestation. The pugnacious attitude of the Moccasin toward other snakes was well illustrated by the escape from a cage in the writer's collection of a specimen of moderate size. This reptile prowled about the "snake room" until, prompted by a spirit of curiosity or seeking a place to hide, it entered the ventilating apparatus and into the cage of a large South American Anaconda. There it battled with the big constrictor, biting him in a dozen places. The catastrophe occurred during the night. Morning revealed the presence of the moccasin, quietly coiled in the quarters of the anaconda, and the twelve-foot serpent lay contorted and dead after its struggles against the action of the formidable virus of its diminutive adversary, a snake of less than four feet.

Captive Moccasins feed upon small rabbits, rats, birds, fishes and frogs. Rabbits and large rats seem to greatly excite these snakes. They strike many times, and wildly, as if in fear of being attacked by the animals. With smaller creatures they do not strike, and then await the death of the animal from the poison, as is characteristic with most Crotaline snakes in captivity, but once seizing the animal they retain their hold, with fangs deeply imbedded, until its struggles have ceased, when swallowing commences. It is the opinion of the writer that *all* of the poisonous snakes feed in this manner when wild,

The Moccasins

unless the prey be very large and powerful, and that the striking of a rattlesnake and the immediate release of the bitten creature is merely a symptom of nervousness exhibited by many of the poisonous snakes which are so high-strung, that they are on the constant *qui vive* in captivity. The Moccasin, possessed of a more stolid disposition shows its natural manners of feeding even when under artificial conditions.

If a man is reckless enough to trust a snake possessing venomous fangs, he may handle one of these serpents with the utmost good-nature on the part of the reptile. Such familiarity with the average rattlesnake would be immediately resented and with disastrous results.

The Moccasin produces small broods of living young, the number varying from seven to twelve. Among several specimens under observation, two produced broods of eight young, each; three gave birth to broods of twelve young, each, and one to a litter of three. A very small female gave birth to one youngster, which fed voraciously and within two years was so much larger than its mother that conditions of parent and offspring appeared to be reversed.

THE COPPERHEAD SNAKE OR HIGHLAND MOCCASIN; PILOT SNAKE; RATTLESNAKE PILOT AND CHUNKHEAD

Ancistrodon contortrix, (Linn.)

Moderate in size and proportionately more slender than the preceding species. The scales are strongly keeled, and the majority of the plates on the underside of the tail are in a single row.

Colouration.—Above hazel brown, with large cross-bands of rich, chestnut brown. These bands are narrow on the back, and very broad on the sides, and when looked at from above resemble the outlines of an hour glass. Beneath, the colour is pinkish-white, with a row of large dark spots on each side of the abdomen.

From the sides, the majority of the bands appear as blunt Y's with the stems directed upward. On most specimens several of the bands are broken on the back, forming inverted V- or Y-shaped blotches on the sides. All of the bands are darker at

their borders, and with some specimens they enclose light patches of colour that match the general hue of the body.

Head Markings.—The head is usually of a paler tint than the body—often evincing a coppery tinge—hence the popular name. The upper lips are of a lighter shade than the top of the head, the line of intersection between the two hues beginning behind the eye and extending to the angle of the mouth.

Variations of Colour.—The ground-colour varies into different shades of brown and gray, but the pattern remains strong and constant, although some specimens occurring inland are dark with an obscure pattern. The writer has examined several specimens of this colour phase from Ohio. They were of a rich, dark brown, with little trace of the bands.

Specimens from Texas are very striking in colouration. With such reptiles the bands are fewer in number, very wide and distinctly reddish. The pattern is further intensified by a narrow, whitish border on most of the bands. With such specimens, the tip of the tail is greenish-yellow, demonstrating that these Texas specimens exhibit a peculiar tendency to retain a trace of the brilliant yellow tail of all the New World snakes of this genus, even to maturity, which is a character in direct variance with specimens from the Eastern States.

When closely examined the majority of specimens will be seen to have the sides thickly powdered with minute, black dots.

The colour of the tongue of this species is rather at variance with snakes in general. This organ is usually red at the base, with whitish forked portion.

Dimensions.—The Copperhead is not a large serpent. After examining several hundred specimens the writer has failed to find a single individual which attained a length of four feet. The largest specimen he has examined was three feet, nine inches in length. It was captured in Georgia, near the coast. This length is considerably above the average of large specimens. The following detailed measurements relate to what might be termed a *large* example of the species:

Total Length.....	33	inches
Length of Tail.....	4½	"
Diameter of Body.....	1½	"
Width of Head.....	1	"
Length of Head.....	1¾	"

The Moccasins

Distribution.—The eastern and central portions of the United States generally, from Massachusetts (inclusive) to the northern portions of Florida; westward to Illinois, and in the extreme South to the Rio Grande in Texas.

Habits of the Copperhead Snake

While alleged to possess a most vicious disposition, the Copperhead Snake by no means displays more hostility than the other poisonous snakes. Like the Moccasin, it becomes very tame in captivity, where it thrives and breeds, showing more vivacity than the Southern snake, but a generally good-natured demeanour toward man.

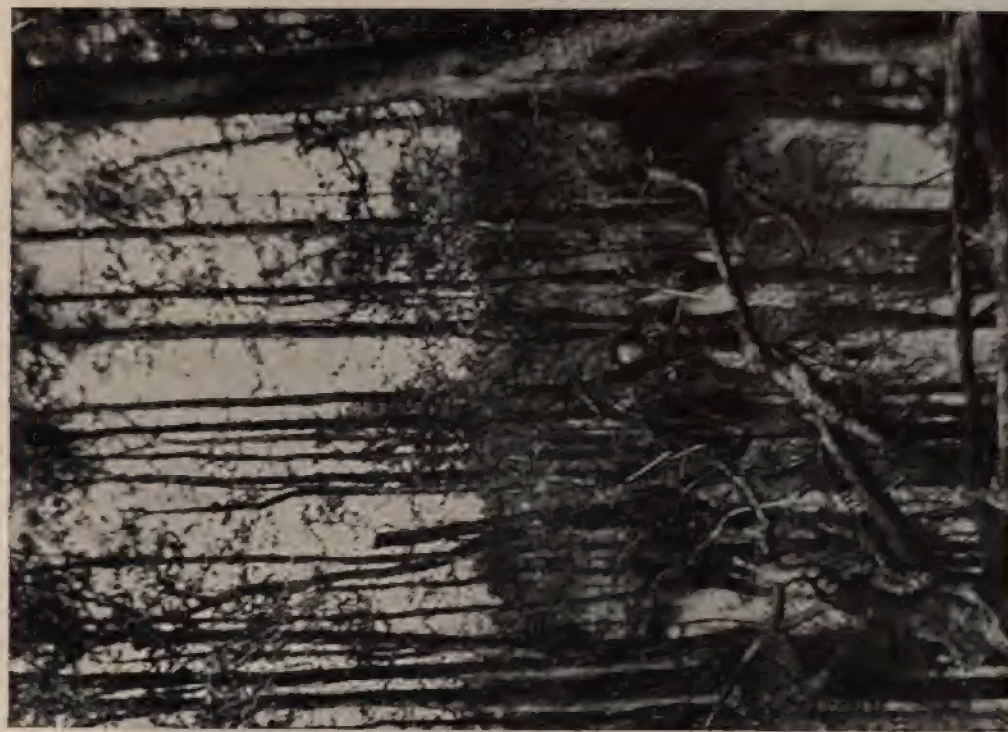
Often in transferring these snakes from one cage to another, the writer has noted their even temper. After being a few days captive, they seldom "strike" and soon begin feeding regularly, a sign among reptiles generally that temper and health are good.

In the Northern States the Copperhead frequents rocky places, usually in the vicinity of moderately thick timber, marshy glades or hollows. Here these snakes find abundance of food in the shape of birds, small rodents and frogs. They also feed upon other snakes. Stone quarries that have been the scene of much blasting and final desertion, are often selected as the abodes of numbers of these reptiles, which hibernate in the deep clefts of the rocks. In the South, judging from the writer's experience, the Copperhead does not frequent the swamps and lowgrounds as does the timber rattlesnake which is distributed over much the same areas as the species in question and in the North occurs in similar rocky situations with the latter. It seeks higher and drier ground. In the coast regions of Georgia and North Carolina none of these snakes was taken in the immediate neighbourhood of the many swamps and stretches of lowground. However, they were moderately common on the neighbouring plantations, where the ground was suitable for planting.

When disturbed in its native haunts this snake will generally make an effort to glide quietly away if escape is open. If caught at close quarters, and flight be impossible, it defends itself vigorously, throwing the body into a series of irregular loops and striking in the direction of the enemy. At such times a rapid, vibratory movement is communicated to the tail, which produces a distinct, buzzing sound, if the serpent be among dry leaves. Throughout



A COPPERHEAD "DEN"
Bird's-eye view of a ledge infested with Copperhead
Snakes, *Ancistrodon contortrix*



HOME OF THE WATER MOCCASIN
A bayou in the Georgia lowgrounds. Harmless water snakes were also found here.
The tree overhanging the water was a favourite basking place



PLATES UNDER TAILS OF POISONOUS AND HARMLESS SNAKES

To the left are the tails of the Moroccan and the Rattle-snake. On the right are the tails of two harmless serpents—the Horned Snake and one of the Racers. It should be noted that the Horned Snakes have a single row of plates under the tail; the harmless serpents have two rows of plates or scales.



DIFFERENT STAGES OF THE RATTLE.

The figure to the left shows the rattle of an old snake; the "rattles" of its youth have been lost and growth has been completed. The adjoining figure is the rattle of a young snake. Third, is the rattle of a snake beginning its third summer; the "button" has been lost. Fourth, is the perfect rattle of a snake about two years old and past to fit the appendage of a one-year old example. The last figure shows the single "button" with which the snake is provided at birth.



LONGITUDINAL SECTION OF THE RATTLE.

A single detached segment is shown.

all these manœuvres the snake is usually backing away in an endeavour to make a dash for safety, by gliding into a nearby friendly thicket or among the rocks. Like the moccasin, if held down with a stick in an endeavour to effect its capture, it fights furiously thrashing the body from side to side in an effort to twist itself free and often in its excitement unconsciously throwing a portion of its body against the widely distended jaws with their sharp fangs, which immediately close, inflicting a wound upon itself, which is never mortal, as the venomous snakes are immune to their own and to each other's poison.

The writer recalls an experience with a large Copperhead in the woods of Pennsylvania. Stopping to rest he seated himself on a large rock, partially covered about its base with a tangled mass of vines. While carelessly swinging a foot against the vines he was startled by a sudden buzz among the dead leaves, and glancing at the base of the rock discovered a large Copperhead, with head drawn back and tail vibrating, backing away by alternately looping and straightening its body. The snake could easily have struck the writer's shoes—although there is doubt whether the fangs would have pierced the leather. Nevertheless the watcher remained quite motionless. Backing away and around the rock the snake suddenly turned and glided for a heavy mass of undergrowth, but it was destined to accompany several harmless snakes collected during the day. Here was an instance of a venomous snake, in an admirable position to employ its fangs, giving warning of its presence by the sound of the quivering tail, then retreating from the subject of its alarm to seek refuge in the thicket without dealing a blow.

The venom of the Copperhead has been declared by reputable authorities to be more virulent than that of the moccasin. Small animals die more quickly after receiving a stab from the fangs of one of these snakes than when bitten by a moccasin of considerably larger size. The fangs are rather small in proportion to the size of the snake as compared with the majority of the Crotaline serpents, especially those of the warmer latitudes. This characteristic also applies to the moccasin. The fangs of the various rattlesnakes are considerably longer in proportion to the general dimensions of those reptiles than with the two species mentioned. By this explanation it is not intended to convey the impression that the Copperhead is not a reptile formidable

The Moccasins

to man. It is indeed a dangerously poisonous snake, and well able to cause death to man if delivering a bite well placed and followed by other than the most energetic and competent treatment.

A captive Copperhead is an interesting reptile and a satisfactory one, as it thrives well under sympathetic care. The feeding habits are rather eccentric and seemingly relate to the possibility of finding certain kinds of food during different phases of the season when the reptile is in a wild state. During the spring and fall, it is very fond of frogs, grasping them with lightning-like rapidity and retaining the hold until the prey is dead. The venom acts quickly upon the cold-blooded batrachian. During the later spring, these snakes prefer young birds, showing in fact such a decided preference to this food that some snakes will fast unless provided with the feathered prey. During the summer months captive specimens will eat small rodents, such as mice and rats, or chipmunks. This preference though not invariable is quite general as noted in caring for many of these snakes. After several years in captivity these reptiles assume a less particular appetite and live contentedly upon a diet of mice and frogs.

The number of young produced by this viviparous snake, is small. From a number of observations it appears to vary from six to nine. A specimen giving birth to the latter number measured two and a half feet in length; the young snakes were ten inches long. When born, the young snakes have brilliant, sulphur-yellow tails. Quite frequently, when the food is introduced into a cage containing small Copperheads, the tails of the little snakes wriggle and twist in a manner that instantly suggests their remarkable similarity to yellow grubs or maggots. When among dried leaves the colours of the young snakes blend so perfectly with their surroundings that it is almost impossible, when a little distance away, to discover them with the exception of the bright yellow tail. Well might the unsuspecting wood-frog as it hops about in search of insect food be attracted to this conspicuous object and toward the jaws of the ever-ready snake. It is very probable that the young Copperhead employs the yellow tail to attract its prey, as does the big snapping turtle, already described, lure the fish within its jaws by the grub-like filament of flesh. Certain it is that the young snakes wriggle

their tails in what, to the unsuspecting frog, might be termed an alluring manner.

During the second year the yellow of the tail fades quickly, and disappears altogether within the third year, except in the Texas form, which retains a greenish-yellow tint through life.*

Herewith are given several records of the birth of young Copperheads, from female specimens captured but a few weeks before the young were born:

Aug.	25.	Brood of 6.	Female from	Fort Lee, N. J.
Sept.	6.	" " 5.	" "	Fort Lee, N. J.
"	7.	" " 4.	" "	Fort Lee, N. J.
"	9.	" " 6.	" "	Greenwood Lake, N. J.
"	10.	" " 7.	" "	North Carolina.
"	10.	" " 9.	" "	Fort Lee, N. J.
"	11.	" " 9.	" "	Delaware Water Gap, Pa.

* This character of the Texas specimens, was first pointed out to me by Dr. Leonhard Stejneger, Curator of Reptiles in the United States National Museum. An examination of a large series of specimens shows this to be quite constant.

CHAPTER XLV: THE RATTLESNAKES

Poisonous Snakes of Two Genera—SISTRURUS and CROTALUS —That are Unique Among Serpents in the Possession of the Rattle

FROM the popular point of view the Rattlesnakes are the most interesting of the American serpents. From an actual standpoint, they are the most important of all the reptiles inhabiting the United States, for among them we find by far the greater number of our poisonous snakes, and species that are next to none in point of deadliness, of the dangerous family of Vipers—the thick-bodied poisonous serpents—that inhabit most of the warmer portions of the globe. Thus the Rattlesnakes are well worthy of detailed consideration.

Aside from their deadliness, the Rattlesnakes possess a strange fascination that attracts scientist and novice alike. Their rich, velvety colours, sinister form and sullen demeanour, combined with the ominous, warning sound of the rattle, are phases of character that produce a lasting impression upon the observer. The writer has studied living examples of many species of deadly snakes—the South American bushmaster and the fer-de-lance, the African puff adder and the berg adder, and such East Indian species as the king cobra, the spectacled cobra and Russell's viper, and although there is indelibly stamped upon his mind the bloated body, the glassy stare and the rhythmic hissing of the berg adder, the rearing, uncanny pose of an infuriated cobra, there is one image vivid above all—the Rattlesnake. Thrown into a gracefully symmetrical coil, the body inflated, the neck arched in an oblique bow in support of the heart-shaped head, the slowly waving tongue with spread and tremulous tips, and above all, the incessant, monotonous whirl of the rattle. One stroke—a flash—of that flat head would inject a virus bringing speedy death. Yet the attitude of the snake is to be admired. It denotes a creature attacked by a powerful enemy and bravely defending its life. The snake never advances, nor makes actually



1, 2 Head of Massasauga, *Sistrurus catenatus*.



3



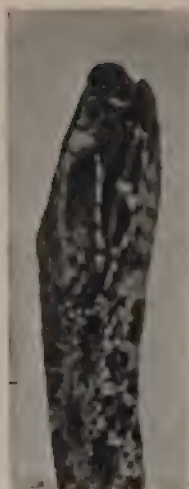
4



5



6



7



8

7 Rattles of Pigmy Rattlesnake, Timber Rattlesnake, and (8) a Texas Rattlesnake, *Crodon affinis*.

PIGMY RATTLESNAKE, *Sistrurus miliarius*

The bite of this tiny rattlesnake is seldom fatal to man. While the little creature vigorously sounds its miniature rattle, the appendage is so small it can not be heard more than a few feet away. Common in South Carolina, Georgia, and Florida

MASSASAUGA, *Sistrurus catenatus*

Grows large enough to be considered very dangerous to man, but is rapidly becoming exterminated over the greater portion of its range

hostile movements. If the enemy retreats but a few steps the reptile endeavours to glide for cover, but at close quarters the attitude spells one word—Beware! As the argument is backed by a pair of deadly fangs, this serpent must be considered, so it seems, as man's very dangerous enemy, and the destruction has long since begun. Of the tens of thousands of these reptiles slaughtered, there may be said to be barely one accident to man in the killing of ten thousand Rattlesnakes. To illustrate this, it might be explained that a death from the bite of a Rattlesnake in the United States is so rare a thing the occurrence appears as a first page paragraph in nearly every newspaper of the Union.

The scarcity of accidents from these reptiles, which inhabit all portions of the United States, may be accounted for by the fact that Rattlesnakes inhabit ground not generally serviceable to man. Moreover, when these snakes are approached, the rattle usually gives ample warning of their presence. On several occasions, as the writer has been hunting for Rattlesnakes, he has heard the rattle from among tumbled masses of rocks—the snake thus disclosing its presence when it might easily have remained concealed.

Although those species of Rattlesnakes that inhabit the open prairies and fertile farming country of the Central and Western States have decreased in number almost to the point of extinction, in many large areas under cultivation, other species that have for a time suffered to a similar extent have of late years become abundant, owing to conditions offering almost complete protection. Large mountain areas in our Eastern States have been bought up as private game preserves. The owners of such estates have a natural desire to preserve their forests and exclude trespassers from their lands, that the deer and pheasants may thrive. The cutting of timber ceases; the old wood trails disappear in a tangle of undergrowth—and the wandering of numerous pot-hunters, who kill every creature that crosses their path, stops altogether in these domains. Some of the most charming country in the East has thus been effectually preserved. It is quite refreshing to the nature-lover to visit one of these great tracts and observe the undisturbed stretches of fine forests in regions that are being devastated by the sawmill. In these great, fenced-in areas, conditions have returned, from the standing of the Rattlesnakes, to what they were when this country was in its

The Rattlesnakes

infancy. The ledges, on which the snakes bask and breed, are no longer molested and the survivors of the race rapidly multiply. The writer was escorted over a superb stretch of mountain and forest in New York State that well illustrated such conditions. Fifty snakes were taken in ten days time from a ledge on this estate. The gentleman who made the capture took all of the snakes alive and explained that he could have caught as many more.

Distribution of the Rattlesnakes.—Northern Mexico and the extreme southwestern portion of the United States appear to be the headquarters of the Rattlesnakes; ten of the total number of thirteen species occurring in the United States are to be found in that region. These are the Western Massasauga, *Sistrurus catenatus edwardsii*; the Black-tailed Rattlesnake, *Crotalus molossus*; the Western Diamond Rattlesnake, *C. atrox*; the Prairie Rattlesnake, *C. confluentus*; the Pacific Rattlesnake, *C. oregonus*; the Tiger Rattlesnake, *C. tigris*; the Horned Rattlesnake, *C. cerastes*; the Green Rattlesnake, *C. lepidus*, the White Rattlesnake, *C. mitchellii* and Price's Rattlesnake, *C. pricei*. Of these species, the Black-tailed Rattlesnake, the Tiger Rattlesnake, the Horned Rattlesnake, the Green Rattlesnake and the White Rattlesnake (and several varieties of these) are confined to that region or immediately adjacent areas. The Pacific Rattlesnake inhabits the western portion of the Great Basin and the Pacific region—thence extends northward into British Columbia, as does the Prairie Rattlesnake which occurs over a great portion of the central United States. The only other species of Rattlesnake that extends northward into British America is the Northern phase of the Massasauga, *Sistrurus catenatus*, (typical), which also occurs in the Central States.

In the eastern portions of the United States, the Timber or Banded Rattlesnake, *Crotalus horridus*, occurs from Vermont to northern Florida, thence westward into the Great Plains. The Diamond-back Rattlesnake, *C. adamanteus*, inhabits a comparatively small area in the East, occurring from North Carolina to Florida (inclusive of the latter state), thence westward to the Mississippi. It frequents the low, swampy country of the coast and is the largest species of the genus.

From this outline it will be readily understood that Rattlesnakes inhabit the United States generally, but with exception

of the Southwest there are few areas where more than one species occurs—except on the borders of the ranges of the different species, where the distribution of one may extend a slight distance into that of another.

Several species of Rattlesnakes inhabit Mexico and Central America that are not found in the United States. One large and very handsomely coloured species is confined to South America. With the exception of one Mexican species extending southward into that continent, this is the only South American Rattlesnake.

The Rattle.—Compared with all other genera of serpents, the rattle is a unique appendage. The closest approach to it is the well-developed spine existing on the tail of many snakes. The natural use of the rattle remains unknown. To presume that the snake is provided with this appendage to warn enemies away from its formidable fangs, is to fall in line of very bold theory. Nature has no apologies to make for the distribution and existence of Her creatures whether innocent or dangerous, and She is not lavish in placing danger signals to guard the unwary. The argument has been advanced that the rattle is used as a call, during the breeding season, which is not illogical, as snakes are not wholly deaf, although lacking external ears. They appear to appreciate the vibrations of certain sounds—possibly with the aid of the delicate tips of the tongue or by means of a sensitive development of the scales. From the examinations of freshly captured snakes, it appears that the rattle is used but little in a state of nature, for it rapidly shows traces of wear and breakage in the frequent use of it by caged specimens, though it may have been quite perfect at the time of their capture. Many snakes, both venomous and innocuous, vibrate the tail when greatly angered. The Rattlesnake does likewise, hence the “warning” sound. There are good arguments pointing to the occasional use of the rattle to decoy prey within the reach of the fangs—but it is the writer’s purpose to explain what is actually known about the rattle and not to enter into theory.

A persistent and popular idea is to the effect that the age of a snake may be told by counting the rings or segments of the rattle. With the majority of specimens, such calculation is impossible. In the case of certain specimens a definite idea of

The Rattlesnakes

the snake's age may be had by counting the segments, but in a different manner than that usually described.

According to the popular and *incorrect* opinion, the snake acquires a new joint or ring of the rattle *every year*, and if one desires to ascertain the age of the reptile it is simply necessary to count the number of rings composing the rattle, and, by allowing a year for each ring, the age of the serpent is known. Let us explain how this theory is wholly incorrect and very misleading.

In the first place, the rattlesnake acquires from two to three rings of the rattle each year—usually three, and sometimes, though rarely, four segments. The rattle seldom attains a length of more than ten or eleven rings, as when that number has been acquired the vibration at the tip, when the organ is used, is so pronounced that additional segments are soon worn, broken and lost. Even though the rattle is seldom employed a longer appendage is awkward, and, coming in frequent contact with rough objects, must soon be broken.

When the young Rattlesnake is born, it is provided with a soft button on the tip of the tail, which, though vigorously shaken in imitation of the parent's rattle, produces no sound, as it is rigidly attached to the tail. Within a few days after birth the young Rattlesnake sheds its skin and commences feeding, taking small mice, or other young rodents. It grows rapidly and in about two months sheds the second skin when the first *ring* or segment of the rattle is uncovered. This has been steadily developing under the old epidermis and at such times its presence was apparent in the swollen appearance at the base of the original button. Immediately after the shedding of the skin, this ring is black and soft. It loosely encases the base of the button, and, after a few days, when the segment has become thoroughly dry and the tail is shaken, a faint, buzzing sound is produced—this caused by the loosely attached button rasping against the dry segment to which it is fastened. Now that the button has become detached from the base of the tail, it becomes a dull straw colour—the general hue of the rattle. At this time the snake has a rattle in miniature. Every succeeding segment is produced in exactly this fashion.

By the time the snake has developed thus far, the hibernating season approaches, and it retires for the winter. April brings it forth again to feed voraciously and begin a rapid growth. Around



A RATTLESNAKE "DEN"

A deep cleft in a ledge in the mountains of Sullivan County, New York, where large numbers of the Timber Rattlesnake, *Crotalus horridus*, gather to bask in the autumn sun and to hibernate



A HAUNT OF THE DIAMOND RATTLESNAKE

A road through the hammocks in South Carolina. The big Southern rattlesnake, *Crotalus adamanteus*, often crossed this road at night. The lagoon on the left teemed with water moccasins, *Amphibatrachus piscivorus*. In the immediate vicinity, the writer, and an assistant captured over three hundred snakes—of various species—in less than two weeks' time.



TIMBER RATTLESNAKE AND NEWLY-BORN LITTER

At birth the little snakes have a single "button" to represent the future rattle. They are provided with perfectly developed fangs and poison-glands. Unless tempted to bask on the sunny ledge frequented by the mother, they leave her within a few hours to shift for themselves.

the early part of June, it prepares to shed its skin again and the distension at the base of the diminutive rattle shows the presence of another "ring" to be uncovered. This ring proves to be considerably larger than the first one; its increased size appeals to the growth of the snake itself. The rattle now appears like Fig. 3 of the series of illustrations. In this way the development of the rattle goes on, each ring being of larger size than the preceding until the snake has attained maturity and growth ceases.

It can thus be appreciated that if the rattle of a snake possesses the original *button* of birth, we may estimate the age of the reptile by allowing the button and first ring for about the first nine months—this including the period of the first hibernation, and counting each *three* additional rings as a year. The reptile usually sheds its skin three times during the warm season, in the spring, during mid-summer and in the fall. If the button has been lost through wear or accident and the rattle has a distinctly *tapering* outline toward its tip, the number of lost segments may be estimated, but if all the segments are of *uniform* size, it will be understood that the rings of youth have been lost and possibly many others. With such a specimen there is no way of ascertaining the age except to realise that it is fully grown and mature at the time the terminal ring of the rattle was developed as this agrees in size with that at the base of the appendage.

Sometimes we find snakes with the segments of the rattle decreasing in size *toward the base*. A specimen captured by the writer in Pennsylvania had a rattle like this. The character was accounted for by stories of nearby residents of an extensive forest fire that swept through the region several years back. At the time of the fire, the snake was probably sheltered in some deep crevice of a ledge and escaped the conflagration, which consumed the fallen and hollow tree trunks in which were the nests of the wild mice and ground squirrels. In consequence, living had been scanty for some time.

Captive snakes that fast for lengthy periods, or feed irregularly, grow rattles like this, but upon regaining their appetites, the succeeding rings are of normal size.

The longest rattle examined by the writer consisted of seventeen segments, which was unusual, owing to the average limited number, as previously explained. On this rattle, the last three rings were worn and broken, and they were shaken from it several

The Rattlesnakes

weeks later when the snake—a black Timber Rattlesnake—was so disturbed that it became greatly enraged and rattled steadily for about an hour. The writer was once asked to examine what was considered a unique possession—in one of our large scientific institutions. This was a rattle consisting of twenty-four rings. Close inspection showed the wonderful organ to be composed of the rattles of three snakes of similar size, snapped into one another. This is easily done. On many occasions in the reptile house of the New York Zoölogical Park it has been found appropriate to adorn fine rattlers that have lost their chief ornament in the excitement of capture, with a rattle from the souvenir box of such curiosities. (A figure shows the internal composition of the rattle).

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The Rattlesnakes are divided into two genera—*Sistrurus*, the Pigmy Rattlesnakes, and *Crotalus*—containing the majority of the species. The species of *Sistrurus* are small, rarely attaining a thickness of a man's forefinger and a length of a yard. *Crotalus* contains species both large and small. A *small* Rattlesnake is one that attains a length of not more than three feet. The large species reach a length of six to eight feet.

A definition is presented of the two genera of Rattlesnakes:

Top of head with large, symmetrical shields. Size small.
Two species and two varieties in the United States.

Genus *Sistrurus*.

Top of head with granular scales—with some species a few small shields on snout, in front of eyes. Eleven species and two varieties in the United States. Genus *Crotalus*.

The **Pigmy Rattlesnakes**, *Sistrurus*: For the snakes of this genus, the popular title of "Ground Rattlesnakes" has become almost proverbial. The writer has decided to drop this name, as one altogether inappropriate. It is really difficult to imagine how such a name could originate. The title is misleading for it tends to signify that these Rattlesnakes live on the ground, and might thus bring the beginner to imagine that the members of the larger genus—*Crotalus*—live in the trees. All of the Rattlesnakes are *ground* reptiles, as none of them exhibits a liking for climbing or swimming. Hence it is altogether wrong to select a small genus of this important group and term the members the *ground Rattlesnakes*. As the species of *Sistrurus* are of very small size as compared to the average Rattlesnake, the

writer has adopted for them the popular title of the Pigmy Rattlesnakes.

The Pigmy Rattlesnakes may at once be distinguished from other rattlers, by the scalation of the top of the head. The head is covered with large, symmetrical shields, arranged like those of the harmless or colubrine snakes. But from the latter the *Sistruri* may be told at a glance by the rattle and the characteristic pit of the family *Crotalidæ*.

The species found in the United States may be concisely defined:*

Key to the Pigmy Rattlesnakes

- I. Ground-colour brownish. Large, dark saddles on the back and a smaller series on side.
 Blotches of the back in close formation; those of the sides of moderate size. MASSASAUGA, *S. catenatus*.
Distribution.—Western New York to Nebraska; Canada to Kansas.
 †Blotches of the back smaller and more separated; those of sides very small.
 EDWARD'S MASSASAUGA, *S. catenatus* variety *edwardsii*.
Distribution.—Southwestern United States.
- II. Ground-colour gray. Large black saddles on back and a smaller series on sides.
 Blotches on back well apart. A reddish streak from behind the head.
 SOUTHERN PIGMY RATTLESNAKE, *S. miliarius*.
Distribution.—Southeastern United States.

Following are detailed descriptions:

THE SOUTHERN PIGMY RATTLESNAKE

Sistrurus miliarius, (Linn.)

A very small species, though stout of form, with distinct, flattened head. The body tapers gradually to a thin tail, which is provided with a minute rattle.

Colouration.—Dark ashy gray, with a series of large, black blotches on the back, these irregularly rounded and separated—on the central portion of the back—by reddish spaces. The

* One other species, *S. ravus*, inhabits Mexico.

† Another variety, technically called *S. catenatus consors* has been described. The pattern is like that of Edward's Massasauga, but the number of scale rows is 25 (like the typical form). Edward's Massasauga has 23 rows of scales.

The Rattlesnakes

reddish, broken line, is more prominent on the forward portion of the body. On the sides are several series of black spots, smaller and less distinct than those on the back. The tail is usually reddish.

Beneath, this species is white, thickly marbled with black spots and blotches.

The large head shields at once distinguish this small Rattlesnake from the young of other species that inhabit the southeastern United States.

Dimensions.—The Southern Pigmy Rattlesnake, or Florida Ground Rattlesnake as it is often called, is the smallest species of rattler inhabiting the United States. Measurements are given of an adult specimen, captured in Marion County, Florida:

Total Length.....	17	inches.
Length of Tail, exclusive of the rattle.....	2	"
Greatest Diameter of Body.....	$\frac{5}{8}$	"
Width of Head.....	$\frac{9}{16}$	"
Length of Head.....	$\frac{13}{16}$	"
Length of Rattle, 6 segments.....	$\frac{3}{8}$	"

The length of the tail should be noted. It is proportionately very long for a Rattlesnake. The rattle of this species seldom exceeds six segments.

Distribution.—Central North Carolina southward throughout Florida, thence along the coastal region of the Gulf of Mexico to Texas. The range extends inland up the Mississippi River valley and the valley of the larger, Southern tributaries. Dr. Stejneger explains: "Curiously enough, it seems to be more common on the western side of the great river, being apparently common in Arkansas and Indian Territory even as far west as central Oklahoma, whence the National Museum has a young specimen collected by Dr. Edward Palmer at Old Fort Cobb."

The species is most abundant in Florida.

Habits.—Owing to its diminutive size, this species is the least formidable of the North American Crotaline Snakes. By many, however, it has been argued that the Coral Snake, (*Elaps fulvius*), should be placed last on the list as regards the virulency of the bites of venomous serpents inhabiting the United States. The writer cannot agree with this contention. Although the fangs of the Coral Snake may be smaller than the weapons of the Pigmy Rattlesnake, the former serpent is provided with a

The Rattlesnakes

more powerful poison which makes up for the deficiency in size of the venom conducting teeth and possibly a smaller amount of poison discharged from them.

The late Dr. C. Slover Allen, whose fondness for snakes, particularly the rattlesnakes, resulted in the maintenance of quite a collection of these creatures, once described to the writer his experience after a bite from a Pigmy Rattlesnake. Dr. Allen said:

"I was placing the snake in a bag, holding the reptile by the neck, when my forefinger slipped and the little creature took instant advantage by turning and burying both fangs in my thumb. I was so used to handling the big 'Diamond-backs' that the bite did not greatly alarm me. Taking an elastic band, I at once applied this as a ligature at the base of the thumb and then opened both fang punctures with a razor, to a greater depth than the teeth had actually gone. I alternately sucked and washed out the wound, applied a solution of permanganate of potash and finally applied a wet, antiseptic bandage. Then I removed the ligature. The thumb throbbed painfully as did the wrist and a portion of my hand was badly swollen, but a day or two afterwards these local symptoms passed away. I attributed my escape from more serious consequences to the almost immediate scarification, application of the ligature and washing of the wounds."

So small is the rattle of this species, that its whirring can be distinguished but the distance of a few feet—about eight feet at most with a full-grown specimen, and barely a yard away from a half-grown snake. When annoyed this little snake will throw its body into a fighting coil and sound its tiny rattle, giving vent to its anger by a series of vicious jabs in the direction of the disturbance. The writer found this species to be moderately common in very dry and sandy areas in South Carolina. These situations were called the "sand hills" by the natives. While collecting there the heat was found to be almost unendurable during the middle of a June day. The vegetation consisted principally of scrub oak, varying from a yard to six feet in height. Burrows of the gopher tortoise were numerous and in these some of the snakes took refuge.

Unlike the majority of the rattlesnakes, which feed only upon warm-blooded animals, this species is fond of frogs.

The Rattlesnakes

These it takes with a lightning-like dart, imbedding the fangs deeply and holding the prey until it is dead, when it is swallowed. Frogs that have been bitten and escaped from the snake die within five minutes or so from the effects of the venom which appears to quickly paralyse them. This rattlesnake will also eat small rodents and very young birds.

The species produces a small number of living young. Seven young were born from one specimen in the writer's collection and nine from another. These young snakes had a very minute "button" to represent the future rattle.

THE MASSASAUGA

Sistrurus catenatus, (Rafinesque)

A considerably larger and proportionately stouter snake than the preceding. The tail is much shorter and the rattle more developed.

Colouration.—The most common ground-colour is grayish-brown. There is a series of large, rich brown blotches on the back, these faintly bordered with white. On each side of the body are three series of smaller blotches, the lower extending over the edges of the abdominal plates. The tail is ringed (above) with dark brown, alternating with the body colour.

The head markings are well illustrated in the photograph and the separate figures of the head from the top and side. Beneath, the colour is dull gray marbled with black, or entirely black. The throat is paler.

Variation.—Various phases of the ground-colour are to be found. Some specimens are very dark brown, with an obscure pattern. Occasional black specimens are found with the pattern barely discernible. One constant and distinct variety occurs; it is separately described.

Dimensions.—The following measurements appeal to an adult, female specimen:

Total Length.	26 inches.
Length of Tail, not including rattle	$2\frac{1}{8}$ "
Greatest Diameter.	$1\frac{1}{8}$ "
Width of Head.	$\frac{3}{4}$ "
Length of Head	$1\frac{8}{16}$ "

This specimen had a rattle consisting of five rings, of uniform size.

Specimens of the length of a yard are not rare. Occasional specimens will measure three and a half feet.

Distribution.—Until a comparatively recent date, the Massasauga extended its range eastward as far as western New York, but it has been noted that this snake rapidly disappears with the cultivation of land for agricultural purposes. It now occurs from Ohio to central Nebraska, its southern limit in the eastern portion of the range being apparently above Indianapolis, thence to the west the range slopes downward into Kansas; further in the Southwest, the typical form is replaced by a distinct variety—Edward's Massasauga. The Massasauga ranges well into the north. It occurs in Minnesota, Wisconsin and Michigan. It occurs in several portions of Canada, being recorded from the shores of Lake Huron and on the peninsula of Ontario.

Habits.—The Massasauga is more essentially a *Rattlesnake* than the diminutive species of *Sistrurus* previously described. Its rattle sounds a fairly loud note of warning, and the noise made by a fair-sized specimen would readily attract a man's attention. The bite of an adult, if properly delivered—both fangs thoroughly perforating the flesh—might readily produce the death of a man.

The Massasauga is a snake of swampy situations. Its habits, and those of the allied southeastern species, more nearly relate to the copperhead snake and the water moccasin, than to the species of the large Rattlesnake genus; for Rattlesnakes generally eat nothing but warm-blooded prey—mammals and birds—while the Pigmy Rattlesnakes feed largely upon frogs. These omnivorous habits, so like the feeding of those Pit Vipers without rattles, must be compared with the close structural relationship of the moccasin and copperhead snake and the snakes of *Sistrurus*; *all have large shields, covering the head.*

Most of the writer's specimens of the Massasauga were received from Michigan and the collector explains that they frequent a considerable area of swampy land. He goes on to say that they are occasionally found in the neighbouring farming country, but their presence in the drier area seems to indicate a wandering from one swamp to another. Of this lot of specimens, the snake having the biggest rattle possessed seven segments. The longest rattle of this species examined, consisted of eight joints. As captives the specimens soon became tame

The Rattlesnakes

and fed readily. They seldom rattled, and then but for five or ten seconds' time. They would take young birds, mice and frogs, and, like the copperhead snake, different kinds of food according to the seasons, a trait probably developed by necessity while in a wild state. One of the Michigan specimens gave birth to seven young; the female was about two feet in length and her youngsters so small that one of them could have readily coiled upon a silver half-dollar and left a good margin about it.

EDWARD'S MASSASAUGA

Sistrurus catenatus, variety *edwardsii*, (B. & G.)

This variety is distinguished by the much paler—yellowish—ground-colour and the smaller spots on the back. The spots on the sides are indistinct. In miniature, the pattern of this snake is much like that of the prairie rattlesnake, (*Crotalus confluentus*).

While the typical form has twenty-five rows of scales, this variety has but twenty-three.

From all of the other rattlesnakes of the Southwest, it may be instantly told by the large plates of the head.

Dimensions.—Like the typical form.

Distribution.—The range of this variety begins from the extreme southern distribution of the typical form and extends from the Indian Territory, throughout western Texas, and westward to about the central portion of southern Arizona. It also occurs in northern Mexico, adjacent to the boundary.

Habits.—It seems that this reptile is less partial to damp situations than the preceding form.

The Rattlesnakes—*Crotalus*: The present genus embraces the Rattlesnakes proper. The species may be recognised from the preceding genus of small Rattlesnakes by the scalation of the head; this small and granular. A few of the species have small shields on the forward portion of the snout—in front of the eyes.

Fifteen distinct species and several varieties of *Crotalus* are known. Eleven of the species and two varieties are found in the United States. Concerning the latter, a key is given:



1



2



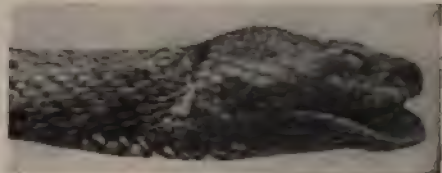
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6



4



7



5



8

NORTH AMERICAN RATTLESNAKES.

1 Diamond Rattlesnake.

Crotalus adamanteus.

2 Western Diamond Rattlesnake.

Crotalus atrox.

3 Pacific Rattlesnake.

Crotalus oreganus.

4 Prairie Rattlesnake.

Crotalus viridis.5 Banded or Timber Rattlesnake, *Crotalus horridus*.

6 Black-tailed Rattlesnake.

Crotalus molossus.

7 Green Rattlesnake.

Crotalus lepidus.

8 Price's Rattlesnake.

Crotalus pricei.



1



3



4



5



6



7



8



9

NORTH AMERICAN RATTLESNAKES

- 1 *Crotalus atrox*.
2 *Crotalus oregonus*.
3 *Crotalus confluentus*.

- 4 *Crotalus molossus*.
5 *Crotalus adamanteus*.
6 *Crotalus pricei*.

- 7 *Crotalus atrox* ("scutulatus").
8 *Crotalus horridus*.
9 *Crotalus lepidus*.

The Rattlesnakes

Division I. A *chain* of large, dark, pale-bordered rhombs—"diamonds."

a. *Diamond markings closed on sides.*

†Size large.

Dark olive; rhombs with yellow borders.

DIAMOND-BACK RATTLESNAKE, *C. adamanteus*.

Distribution.—Southeastern U. S.

Grayish; rhombs with whitish borders.

WESTERN DIAMOND RATTLESNAKE, *C. atrox*.

Distribution.—Texas to southern California.

Reddish; rhombs with whitish borders.

RED DIAMOND RATTLESNAKE, *C. atrox* variety *ruber*.

Distribution.—Southern and Lower California.

††Size moderate.

Dull white or pinkish, with very obscure, rhomb-like markings.

WHITE RATTLESNAKE, *C. mitchellii*.

Distribution.—Southern California, Lower California and Arizona.

b. *Diamond markings narrowly open at sides and continued downward as narrow bands.*

Yellow or greenish. Two paler blotches within each rhomb.

BLACK-TAILED RATTLESNAKE, *C. molossus*.

Distribution.—Arizona, New Mexico and Mexico.

Division II. A *row* of rounded, dark-bordered blotches, well separated.

a. *No horn over the eye.*

A pale band, one scale wide, in front of eye.

PRAIRIE RATTLESNAKE, *C. confluentus*.

Distribution.—Central United States; Canada to Mexico.

A pale band, two scales wide, in front of eye.

PACIFIC RATTLESNAKE, *C. oregonus*.

Distribution.—Extreme Western States.

†††Size small.

Two rows of blotches on forward portion, fusing into a single row in rear of body.

PRICE'S RATTLESNAKE, *C. pricei*.

Distribution.—Arizona and Mexico.

b. *A horn over each eye.*

Yellowish; square, dull blotches on back and black spots on sides.

HORNED RATTLESNAKE, *C. cerastes*.

Distribution.—Deserts of Arizona, Nevada and California.

Division III. Markings in the form of dark, transverse bands.

a. *Bands angular.*

*Size moderate.

The Rattlesnakes

Bands angular in the rear—sometimes broken into three blotches—the central the larger.

BANDED RATTLESNAKE, *C. borridus*.

Distribution.—Eastern United States, Vermont to Florida; westward to the Plains.

b. *Bands even*.

Yellowish or gray; three series of blotches on anterior portion of body. Ring-like bands—close together—on latter two-thirds of body.

TIGER RATTLESNAKE, *C. tigris*.

Distribution.—Desert mountains of Southern California, Arizona and Nevada.

**Size small.

Greenish; narrow and regular black bands at a considerable distance apart.

GREEN RATTLESNAKE, *C. lepidus*.

Distribution.—Region of the Mexican boundary—western Texas to western Arizona.

Following are detailed descriptions of these serpents:

THE BLACK-TAILED RATTLESNAKE

Crotalus molossus, (B. & G.)

By the uniform jet-black of the tail, this fine Rattlesnake is readily distinguished from the other species occurring in the Southwest. It attains a fair length—from three and a half to five feet, and is proportionately stout of body. The head is large, and quite blunt at the snout. On the upper portion of the snout are three pairs of enlarged scales or shields.

Colouration.—The ground-colour above is rich sulphur-yellow, yellowish-brown, or olive. Down the back is a series of brown rhombs, with a narrow, yellow border, *and open at the sides, whence they extend to the abdomen as narrow bands*. Each of the rhombs usually contains two yellowish blotches. Toward the tail the markings become obscure. *The tail is uniform black.* *

With the exception of a brown blotch or band on each side of the head, behind the eye, there are no head markings.

Dimensions.—The largest specimen examined by the writer was forty-nine inches long. It was fully adult, with a rattle consisting of nine, perfectly equal segments, and was captured in the mountains near Tucson, Arizona.

* Occasional specimens are said to have the tail alternately barred with the ground-colour and black.

The Rattlesnakes

Following are the measurements of a young specimen captured in Mexico, a short distance over the border and south of Arizona; although these measurements are below that of the adult, they show the general proportions:

Total Length.	20	inches.
Length of Tail, not including rattle.	1	"
Greatest Diameter.	$\frac{3}{4}$	"
Width of Head.	$1\frac{3}{8}$	"
Length of Head.	$1\frac{1}{8}$	"

The specimen had a perfect rattle of five segments and, judging from the size of the basal ring, was about two-thirds grown.

Distribution.—In the United States the range of this species extends but a slight distance north of the Mexican boundary—not beyond the central portion of Arizona and as far north as this it is rare.

North of the Mexican boundary it occurs from the Pecos River in Texas to slightly more than the central portion of Arizona. The most northerly record of capture in New Mexico appears to be Fort Bayard. Two specimens were captured by Dr. E. Coues on San Francisco Mountain, in Arizona.*

In New Mexico and Arizona, immediately adjacent to the Mexican border the species seems to be common. The writer has received several skins from Tucson, Arizona. Following is a paragraph from a letter from Mr. Herbert Brown, of Yuma, Arizona: "The Black-tailed rattlesnake is fairly common in the Santa Catalina and Rincon Mountains, near Tucson."

The range of this snake into Mexico is not definitely known.

Habits.—Like many of the rattlesnakes this species frequents rocky places, lurking in the vicinity of the mountain ledges where the numerous fissures afford it shelter.

THE BANDED OR TIMBER RATTLESNAKE

Crotalus horridus, (Linn.)

In its pattern and colours this Eastern species exhibits great variation. It is the only rattlesnake occurring over the greater portion of its range, but in the South and West its distribution overlaps the range of several species; they are so distinct as not

* Stejneger, Report of U. S. National Museum, 1893, p. 426.

The Rattlesnakes

to be readily confused with it. The average length is from three and a half to four feet.

Colouration.—The most familiar phase is that of a sulphur-yellow ground-colour, with wide, dark brown or black cross-bands, these usually wavy or sharply pointed in the rear—sometimes broken up into three series of blotches—the larger on the back in the shape of half-rhombs. The tail of such a specimen is black.

Another common phase is olive. On the forward portion of the body are three series of dark blotches, margined with yellow; these fuse into wavy, yellow-edged cross-bands on the posterior two-thirds of the body.

The ground-colour varies from yellow to brown, olive or black. With the black specimens the bands are not discernible. These black rattlesnakes are common in the mountains of the Virginias, Pennsylvania and New York, and, after freshly casting their skins, have the soft, rich effect of black velvet. The writer has found that the majority of the black specimens are males, although among them he has found occasional females. He has never among yellow individuals found a male specimen—that is in the localities where the black phase is to be found. The most beautiful specimens he has examined were captured in the cane-brakes of South Carolina. The ground-colour was a delicate shade of pink, the cross-bands jet-black; on the central portion of the back, for the width of about three scales, was a stripe of rusty-red. Subsequent investigations show that this marked and apparently constant form occurs from North Carolina to northern Florida, along the low, coast region, and westward along the Gulf Coast to Louisiana. It is locally known as the Cane-brake Rattlesnake. In a way, the colouration of this phase appeals to western individuals, as they may be pale brown or gray, and exhibit the pronounced reddish or tawny stripe upon the back.

The general pattern of this species is well illustrated in a photograph taken of a specimen that has freshly shed its skin. Illustrations are given of the most characteristic phases—the Yellow Timber Rattlesnake, and the Black Timber Rattlesnake, both from Pennsylvania.

Dimensions.—To represent the usual size of an adult specimen of this snake, the measurements of a Pennsylvania spec-

TIMBER RATTLESNAKE, *Crotalus horridus*. Yellow Phase

The species inhabits eastern North America, from New England to Florida (inclusive). In the mountainous districts of the Northern States, the greater number of females are sulphur yellow, while the males are black, though this rule as to sex does not always hold good.

TIMBER RATTLESNAKE, *Crotalus horridus*. Black Phase

When such examples have recently shed the skin the body presents a rich, velvety appearance.



WESTERN DIAMOND RATTLESNAKE, *Crotalus atrox*
A Western ally of the Diamond Rattlesnake. Grows to a length of seven feet



RED DIAMOND RATTLESNAKE, *Crotalus atrox ruber*
The body hue is a distinct, rusty red, while the markings are quite obscure. The distribution is limited to the extreme western portion of the Colorado Desert and the arid ranges in Lower California

The Rattlesnakes

imen are noted. This particular specimen showed average dimensions among several dozen specimens from the Eastern States:

Total Length	.....	3 ft. 8	inches.
Length of Tail (exclusive of rattle).....	2 $\frac{3}{4}$	"	
Diameter of Body.....	1 $\frac{5}{8}$	"	
Width of Head.....	1 $\frac{3}{8}$	"	
Length of Head.....	1 $\frac{3}{4}$	"	

The rattle consisted of ten perfectly uniform segments.

The writer's largest Pennsylvania specimen measured five feet and one inch in length. The largest specimen he has ever examined measured exactly six feet. It was two and a half inches in diameter at the thickest part of the body, but the head was proportionately very small, showing a total width of one and seven-eighth inches. The rattle was made up of fourteen perfectly uniform segments. This fine specimen was captured in Missouri.

Distribution.—The range of the Banded Rattlesnake is extensive. It occurs from central Vermont to the northern portion of the Florida peninsula, thence westward to Iowa, Kansas, the Indian Territory and eastern Texas. In the mountainous districts of this large area the species is common, although from the larger, cultivated districts it has for some time disappeared. Again in the swamps of the coastal region—in the Atlantic States and Gulf States, the lowland phase, or Cane-brake Rattlesnake is abundant. The species abounds in the mountains of southern New York, Massachusetts and eastern Pennsylvania, and actually appears to be increasing in numbers, in these states, year after year.

Habits of the Banded Rattlesnake

In the North this serpent shows a marked fondness for mountain ledges, cleft with many fissures and on which lie large shelving rocks. About such rugged situations large numbers of rattlesnakes gather in the fall, preparatory for the hibernating season. They appear to find the same places, year after year, making their way from the adjoining timber and lesser ledges as if led by some strange, instinctive power. On the main ledge, they coil sociably in great clusters to enjoy the sun of "Indian summer"—but only for a limited number of days, when they retire into the deep fissures for the winter's sleep. For several

The Rattlesnakes

weeks—in the spring—during the mating season, they linger on the main ledge in large numbers, but finally scatter to the timber for the warm months.

These places are the so-called “rattlesnake dens.” During the summer but occasional snakes are observed in the vicinity. The accompanying photographs indicate the character of a “den.” (Illus. Rock Cabin Ledge.) The snakes hibernate in the fissures leading back from the cavern, which faces the south while upon the top of the ledge, the writer has obtained a number of specimens each summer.

Though after the spring the snakes leave the hibernating ledge—generally so situated as to be exposed to the sun for the greater part of the day—they display a marked persistency in following the ledge into the timber where they frequent outcroppings of the same vein of rock, or adjacent and smaller ledges that are surrounded by ground where the hunting is good. These veins of rock traversing the mountains of New York, Pennsylvania and many of the Eastern States are generally associated with the presence of rattlesnakes which are but rarely found any distance from them. This may be explained by the existence of many fissures and hiding places on the ledges. From the presence of numerous shed skins it appears that various snakes have favourite places of concealment, and from these they do not wander far during the course of the summer.

Of the various rattlesnakes inhabiting the United States, this is the most mild-tempered species. It becomes so docile in captivity that the majority of specimens may be actually handled with the same freedom as a harmless snake without showing signs of irritation—a trait particularly characteristic of male specimens. While this has frequently been done by reckless persons, the writer begs to explain that he is not advising the student to try the dangerous experiment. The fact should always be in mind, in studying poisonous snakes, that no matter how gentle may be the demeanour of the serpent, it is provided with fangs, and can produce a deadly wound in lightning-like fashion, and moreover, though a venomous snake be extremely good-natured, there lurks within its brain a nervous and instinctive tendency to instantly employ the fangs if the movements of a nearby object appear suspicious or threaten danger. And it takes but little to provoke a poisonous snake. A quick

movement, a slightly increasing pressure of the fingers to restrain a movement on the reptile's part—and the fangs have done their work. It is almost involuntary for the more irritable of the venomous snakes to instantly turn and bite at an object that presses against their bodies. This tendency may be noted in a snake freshly killed, and decapitated. Upon pinching the reptile's side the headless neck will fly around to the spot in a manner thoroughly startling to the individual accidentally figuring in such a demonstration. At the same time, the severed head is very dangerous for if the neck is grasped carelessly an inch or so behind the head, the latter will instantly turn and bite in the same fashion as if attached to the living snake. The writer has witnessed some narrow escapes from injury, by persons who were not acquainted with the tenacity of life, exhibited in the muscles of snakes that had been harshly belaboured with an axe or club.

A gentleman with whom the writer is acquainted, is unfortunately "gifted" with considerable recklessness in handling poisonous serpents. The former had a number of rattlesnakes in his collection which he handled with the greatest indifference, permitting the reptiles to crawl through his fingers and over his arms like ordinary harmless snakes. They were in his possession for several months, and during that time no accident resulted from his careless exhibitions of the creatures to his friends. One day he discovered that the largest of the snakes was the mother of nine little ones. In the haste to open the case to examine the youngsters he so disturbed the female that she coiled and rattled vigorously. With his usual display of recklessness he removed all of the baby rattlers, that were gliding over and around the parent, *and without accident*. After such blind daring without bad results, it is interesting to explain that this careless herpetologist soon received his lesson. Placing the young reptiles on a table to watch their movements, he was embarrassed by their inclination to glide in all directions. In preventing one of the babies from dropping over the edge of the table, the man was bitten. Although the snake was but a few hours old, its tiny fangs produced an injury that served as a practical and painful demonstration of the effects of rattlesnake poison.

In a wild state, the Banded Rattlesnake prefers flight to combat and, though rattling harshly when disturbed, will generally glide away, sounding its warning note as it goes, in graceful,

The Rattlesnakes

though not rapid undulations, heading toward crevices in the rock or the undergrowth where it at once seeks concealment. If cornered it will fight bravely, assuming a loose and irregular coil, and striking with such dexterity that the eye can scarcely follow the movement. It strikes generally a third, sometimes half its length, but never springs bodily as alleged by the writers of sensational snake stories. Nor is it necessary for the snake to be coiled to deal a blow. While retreating toward shelter it will often turn and from a crawling position draw back the head by contracting the neck into an S-shaped loop, and strike readily.

In the coast swamps of South Carolina and Georgia, the "Cane-brake Rattlesnake" is rather different in habits from its ally of the mountain ledges. This phase of the Banded Rattler grows to a large size and the majority of specimens are vicious and untamable. Their temper is quite as different as is the malarial lowgrounds they inhabit, when compared with the rugged, mountain haunts of the upland phase of Timber Rattlesnakes.

The food of the Banded Rattlesnake consists entirely of warm-blooded prey in the shape of small rabbits, squirrels, rats, mice, and birds.

Like all of the rattlesnakes, this species is *viviparous*—bringing forth living young, that are provided with a single "button" at birth representing the future rattle. The young are of much the same colouration as the parent, but a yellow snake will frequently give birth to young that represent both the yellow and the black phases, as has also been frequently noted with black females.

Following are notes pertaining to the birth of several broods, from females that had been but a few weeks in captivity:

Sept. 6.	Brood of 12.	Female from Pike Country, Pennsylvania.
" 7.	" " 9.	" " Sullivan County, New York.
" 12.	" " 12.	" " " " " "
" 12.	" " 7.	" " " " " "
" 18.	" " 9.	" " " " " "

A specimen of the brood born on September 6th, was exactly twelve inches long at time of birth. This same snake—after feeding regularly—was again measured on November 19th, and found to be fourteen and a half inches in length.

THE DIAMOND-BACK RATTLESNAKE

Crotalus adamanteus, (Beauvois)

Largest of the rattlesnakes. Fully adult specimens are from six to eight feet long. The body is stout and heavy, the head very broad, flat and distinct from the neck.

Colouration.—Olive or grayish green, with a chain of large, diamond markings of a darker hue, these with bright yellow borders about the width of a single scale. The rhombs usually enclose a patch of the ground-colour; toward the tail they become obscure and finally fuse into cross-bands; the tail above is olive, ringed with black. The abdomen is dull yellow.

On the top, the head is brown or olive, with numerous dark spots. Beneath the eye is a dark band, bordered on each side with a narrow band of bright yellow.

With the exception of a more vivid pattern, young specimens are like the parent.

Dimensions.—The largest specimen measured by the writer was eight feet, three inches in length. Its diameter was four and a half inches, and the head three and a quarter inches wide. Specimens of such dimensions are rare. This large specimen was captured in the central portion of the Florida peninsula. The measurements quoted are of a specimen taken in the vicinity of the Indian River, Florida:

Total Length	6 feet, 3 inches,
Length of Tail, exclusive of rattle.....	6 "
Length of Rattle, 9 segments....	2½ "
Greatest Diameter of Body	4 "
Width of Head	2⅞ "
Length of Head.....	3 "

The fangs of this specimen were seven-eighths of an inch in length.

Compared with the most deadly known species of poisonous snakes of the world, the Diamond-back Rattlesnake ranks *second to none*. Its huge fangs, and enormous poison glands, represent the maximum degree of deadliness attained by the viperine serpents. The well-known and terrible bushmaster, (*Lachesis mutus*) of tropical South America attains a larger size than this rattlesnake and consequently has larger fangs, but a careful examination of the fangs of the two species will show that the opening at the tip of the tooth for the ejection of venom is

The Rattlesnakes

proportionately much larger with the *Crotalus*. The other rival of our big rattlesnake, in point of supreme deadliness, is the king cobra or hamadryas, (*Naja bungarus*) of Malaysia. But this is a slender-bodied colubrine snake, and, while attaining a length of twelve feet, has fangs that are barely a third of an inch long. Its venom acts in a different fashion from that of the vipers—immediately attacking the nerve centres.

In the structure of the fangs the Diamond-back Rattlesnake, its near ally the western diamond rattlesnake, *Crotalus atrox*, and the variety *ruber*, together with the black-tailed rattlesnake, *C. molossus*, are interesting examples, for these serpents have proportionately larger fangs than other venomous snakes of the United States. In this character they appeal directly to the South American species of *Lachesis*—the bushmaster—the fer-de-lance *—the jaraçaca † and others that have enormously developed, poison conducting teeth.

Distribution.—Low, coastal regions of the southeastern United States, from southern North Carolina southward throughout Florida and westward to the Mississippi River. The species is most abundant in Florida and occurs on many of the keys.

Habits of the Diamond-back Rattlesnake

Most deadly of the North American poisonous snakes and ranking in size with the largest of the tropical venomous serpents of both the New and the Old World, this huge Rattlesnake with its brilliant and symmetrical markings, is a beautiful and a terrible creature. Ever bold and alert, ever retaining its wild nature when captive, there is a certain awe-inspiring grandeur about the coil of this formidable brute; the glittering black eyes, the slow waving tongue, and the incessant, rasping note of the rattle. All dignity, the "Diamond-back" scorns to flee when surprised. His neighbour, the cane-brake rattler, may retreat in good order, rattling as he goes, but retreating nevertheless; with this pirate of the hummocks, it is different. The mere vibration of a step throws the creature upon guard. Taking a deep inhalation, the snake inflates the rough, scaly body to the tune of a low, rushing sound of air. Shifting the coils to un-

* *Lachesis lanceolatus*. South America and the West Indies.

† *Lachesis atrox*. South America and the West Indies.

The Rattlesnakes

cover the rattle, this is "sprung" with the abruptness of an electric bell. There is no hysterical striking, but careful watching, and if the opportunity to effect a blow with the long fangs is presented, the result is generally mortal.

If outstretched, when surprised, the snake invariably throws the body into a *symmetrical* coil, doubling the neck into an S-shaped loop with the head drawn well back and within the circle of the body. Various rattlesnakes of the West, the copperhead snake and the moccasin will strike from various positions and often aim blows while crawling, but the Diamond-back persists in its perfectly round and graceful coil, while on the defensive. To observe a large specimen taken unawares and literally fling itself into fighting position, is to see determination and courage that exists among few reptiles. Occasionally, though rarely, a Diamond-back will glide for cover if disturbed. This is the case when a hiding place is immediately adjacent. Generally described this serpent might be said to be the most courageous of the North American snakes.

Pine swamps and hummock lands are the abodes of the Diamond Rattler. In the South Carolina lowgrounds we found that these reptiles displayed the habit of hiding under the broad leaves of the dwarf palmettoes during the day, and issuing for their food at twilight. So closely do the body-colours blend with the vegetation and the effect of sunlight and shadow, that the coiled snake is seen with difficulty. The writer was shown the large, hollow stump of a tree on the edge of a pine swamp, in South Carolina. From this hiding place a big Rattlesnake had several times been seen to emerge and glide into the growth of the swamp. Rabbits were common in the vicinity and these animals appear to form a large percentage of the snakes' food. While some weeks were spent collecting in this vicinity, but two rattlesnakes were taken, although their tracks across the sandy roads were frequently seen, and always demonstrating their prowlings to be at night.

When progressing in leisurely fashion, this species adopts tactics characteristic of the thick-bodied poisonous snakes generally—slow progress in a perfectly straight line, with head slightly upraised. Thus the flattened trails of the big Diamond-backs across the dry, sandy roads, as they crossed from swamp to swamp were as straight as the course of a wheel. Aside from

The Rattlesnakes

the trails, other traces of this dreaded snake were several times evident, in the loss of several fine dogs, which, making their way under the floors of the numerous deserted cabins in the neighbourhood, had been bitten and staggered into camp in a dying condition.

As a captive, the Diamond-back differs from most snakes in the display of a persistently sullen disposition. Few specimens become enough accustomed to captivity to refrain from using their rattles vigorously upon the slightest disturbance. While Rattlesnakes of other species may lie silently all about them and yet be fresher captive than themselves, the rattles of the Diamond-backs are seldom quiet if an observer be near. It is not necessary for these snakes to see a human form to display annoyance. So sensitive are they to vibration that a foot-fall starts their rattles which continue buzzing for some time, then gradually settle to a monotonous chick-chick—chick-chick—chick-chick—chick—chick—chick—and cease to sound. Morose and hostile lie these sullen coils, for month after month, never taming, but always ready to fight and sound the tireless rattles.

Taking thus unkindly to captivity, the Diamond-back is indifferent in its feeding habits. Some specimens absolutely refuse to partake of food at all and gradually starve themselves to death, while others feed so sparingly that they ultimately meet the same fate. A large specimen in the writer's collection fasted for thirteen months, or rather would have done so if it had not been fed by pushing food down its throat—*though this was done but three times during that lengthy period*. After the expiration of the time mentioned, this snake began to feed of its own accord—taking half-grown rabbits—and thrived for several years. A Rattlesnake that feeds regularly, is rarely one that uses its rattle to any extent.

The favourite food of the Diamond-back Rattlesnake is the common wild rabbit, or "cotton-tail"; in captivity ordinary domesticated rabbits may be substituted. These snakes will occasionally take guinea pigs and sometimes rats, but the writer has never succeeded in inducing them to feed upon feathered prey of any kind.

The manœuvres of the average specimen when feeding in captivity, are interesting. They illustrate how nervous is this

The Rattlesnakes

snake when removed from its natural surroundings. A medium-sized rabbit is placed in the cage and the snake at once shifts its coils to a striking posture. The rabbit betrays no signs of fear and may hop toward the reptile which warily draws back its head. While nosing about, the rabbit momentarily presents its side to the snake and like a flash of light the deed is done. The human eye can observe but two things. First—the snake appeared to strike for the rabbit and secondly—to have barely touched it with its jaws; but during that blurred movement, several things have happened, thus: The snake struck for the rabbit with opening jaws; when its head reached the prey its jaws were very wide apart and the fangs raised to such an extent that they were cast directly forward; the fangs pierced the rabbit; the jaws were closed sufficiently to deeply imbed the fangs; a muscle over each poison gland was contracted and a considerable quantity of venom was injected. Some of these movements were simultaneous. But the effect upon the rabbit must be noted. The snake is back in the original position before the rabbit's frightened squeal is over. The little creature bounds forward, rolls on its side, kicks convulsively, and is dead. Barely one minute passes from the time of the serpent's stroke to the termination of the death struggle. Possibly some reader may think this is a cruel performance. If so that reader debates a provision of Nature that none among us should be bold enough to criticise. And just a word about this so-called "cruelty" as compared with the habits of those who have criticised the feeding of reptiles.

There are many in the human family, who preach strongly against alleged cruelty, yet think nothing of taking a pack of vicious dogs to assist them in running a helpless deer to within range of a charge of buckshot. Many an animal has staggered into a thicket with broken leg or shoulder to bleed and die slowly for the sake of "sport." Is *this* a provision of Nature? Yet the writer remembers an instance when a gentleman, very fond of a much-used collection of rifles and shotguns, once remarked upon witnessing a rattlesnake being fed, that the snake exhibited the most demoniacal cruelty he had ever seen displayed and the creature should be fed raw meat or nothing.

But to return to the rattlesnake and the dead rabbit: The snake waits patiently until it is satisfied that the last spark of life

The Rattlesnakes

has departed, when it uncoils and begins an examination of the prey. This is a careful and quite extraordinary performance. Gliding about the rabbit it places its snout close to the animal's body and probes with the tongue tips into the fur. The examination leads finally to the dead creature's head and here the snake makes a more detailed investigation. The slightest move on the part of the observer would probably conclude the whole affair, the snake rattling sharply for a few seconds, then leaving the prey, coils up again and refuses to eat. But in the event of not being disturbed, touches the head lightly with the tongue tips, a dozen times or more. At last opening its mouth, the snake seizes its prey by the nose, when the engulfing process begins, the long fangs lending valuable assistance in hooking the animal into the reptile's mouth and throat.

The Diamond-back Rattlesnake gives birth to from seven to twelve young. These feed readily upon mice at the start, and grow rapidly, fully maturing within two years. Captive-bred specimens are quiet, good-natured and feed voraciously. They are hence more satisfactory than specimens captured wild.

THE WESTERN DIAMOND RATTLESNAKE

Crotalus atrox, (B. & G.)

Next to the diamond-back rattlesnake of the southeastern United States, this is the largest species of the genus. It attains a length of seven feet.

Colouration.—The pattern is very similar to that of the preceding and allied species, but the ground-colour is different as is the tail, which is white, with jet-black rings.

The ground-colour may be yellowish gray, pale, bluish gray or pinkish, according to locality; the pale borders of the diamond markings are dull white. Compared with the rich, olive and yellow tints of the Eastern species, the present reptile evinces a dull and faded pattern.

The most showy individuals are from the desert regions of Arizona. The ground-colour is distinctly pinkish, the borders of the rhombs vividly outlined in white; the tail chalky white with jet-black rings.

On all specimens the head markings are similar to the allied species, but the pale stripes on the side of the head are not so vividly defined.



MOUNTAIN DIAMOND RATTLESNAKE, *Crotalus atrox*—phase *scutulatus*
Recognised by the irregular plates between the eyes. See heads of rattlesnakes



BLACK-TAILED RATTLESNAKE, *Crotalus molitor*
Abundant in the mountains of the Southwest near the Mexico. Identified by the jet black tail. One of the larger species



PRAIRIE RATTLESNAKE, *Crotalus confluentus*

A reptile swarming over the western prairies. The clay-colored markings are in perfect harmony with the soil. Few examples are over four feet long



PACIFIC RATTLESNAKE, *Crotalus oregonus*

The common rattlesnake of the Pacific Region. A jet black phase is abundant in the northern portion of the range. An adult is about four feet long

The Rattlesnakes

Dimensions.—Occasional specimens six feet in length are taken, and sometimes, though very rarely, seven-foot specimens are recorded. All of the records for these very large specimens seem to come from Texas. Records from various localities prove interesting conditions regarding dimensions, for there appear to be several races of the species, some dwarfed and seldom growing to a length of four feet; others averaging a length of five feet with quite slender bodies; while from some localities all of the snakes develop to a considerable size and are more thick-set than the former reptiles. From several dozen Texas specimens an average has been figured, and follows:

Total Length.	4 feet, 6 inches.
Tail, without rattle.	$3\frac{3}{4}$ "
Diameter of Body.	$2\frac{1}{4}$ "
Width of Head.	$1\frac{7}{8}$ "
Length of Head.	$2\frac{1}{8}$ "
Length of Rattle, 10 segments.	$2\frac{1}{4}$ "

Distribution.—The species occurs principally in the sub-arid and desert regions of Texas and the Southwest. It is found commonly in central and western Texas, southern New Mexico, Arizona and southern California. Although it may be said to be most abundant in Texas where it occurs over a large area, it is the most common rattlesnake of the genus throughout the entire range. Its habitat extends well into the Tableland of Mexico, but in this part of the range a peculiar phase of colouring and scutellation of the head, is treated in a succeeding description.

Habits.—Like the Southeastern Diamond-back Rattlesnake, this is a nervous and irritable serpent, but as a captive is more hardy. It will take rats, rabbits, guinea pigs and birds. An example seventy-three inches in length has lived in the reptile house of the New York Zoölogical Park for over four years. The snake is given a half-grown rabbit regularly, every week. Unless preparing to shed its skin it never refuses the morsel. When the snake arrived from Texas, it was particularly vicious for one of its species, literally hurling the body into a coil and striking repeatedly at its keeper—and it has remained so. In spite of the four years' attention Keeper Snyder has given it, in the cleaning of the cage and presenting the food, the creature strikes immediately as the door is slid back. A step in the passageway behind the cages causes this dangerous brute to

The Rattlesnakes

rattle nervously, shift its coils and inflate the body for combat. On three occasions a companion of the same species was placed in the cage, and this in each instance resulted in the original occupant refusing to feed. Upon the third trial it stubbornly fasted for six weeks, when the offending serpent was removed. The big rattlesnake took its rabbit two days after.

THE MOUNTAIN DIAMOND RATTLESNAKE

(Mexican Phase of *Crotalus atrox*)

On the Mexican Tableland, which extends into southern Arizona, is a peculiar phase of *Crotalus atrox* that might be confused with a more westerly species—*Crotalus oregonus*—owing to the diamond markings (on most specimens) being rather blunt and well separated—not forming a connected chain. Such examples are yellowish or greenish, and the black and white bars on the tail are dull and broken. These snakes appear quite different from the powdery gray form, with the vividly marked black and white tail, of the sub-arid plains and the deserts. The head markings resemble *Crotalus oregonus*, owing to their definition and the breadth of the forward bar. Such specimens have the forward portion of the head covered with irregular plates, but no two examples show this character to be exactly alike.

For this snake the technical name, *Crotalus scutulatus*, has been proposed, but the many variations connect it with *Crotalus atrox*. From the mountains near Tucson, Arizona, the writer has received many specimens and in all degrees of variation; while all of the examples are distinctly green, the pattern varies from a chain of rhomb-like markings (on a few) to a series of well separated, dark brown blotches. The average length is three and a half feet.

To Dr. Leonhard Stejneger, the writer is indebted for further information concerning this rattlesnake. Following is part of a letter from Dr. Stejneger, relating to some of the Tucson specimens:

"They are very interesting as they bear out my contention that *Crotalus scutulatus* is not a definable form, but only represents a tendency in the Arizona-Sonoran specimens to revert to the original condition, or else they represent the last vestiges of this condition, it making but little difference, with regard to the right of the form to have a name, which theory you adopt."

The Rattlesnakes

Habits.—Seems to be essentially a mountain reptile. All of the Tucson specimens were taken at an elevation, some of them on ledges in company with the black-tailed rattlesnake. *Crotalus molossus*. The typical form of *atrox* was common in that vicinity, but always in the desert.

THE RED DIAMOND RATTLESNAKE

Crotalus atrox, variety ruber, (Cope)

The Red Diamond Rattlesnake differs from the typical form only in the distinctly reddish hue of the former.

Colouration.—Ground-colour dull, rusty red; the diamond markings are of a deeper red, narrowly margined with dull white.

The tail is in marked contrast to the red of the body. It is chalky-white, with vivid, black rings.

Dimensions.—Much like the typical form. It grows to a considerable size though not equal to the length of the largest Texas specimens of the typical *atrox*. The writer had a female specimen from San Diego County, California, that was five and a half feet long. Of four other specimens received from the same districts two were under four feet, one measured four feet three inches and the other, four feet eight inches.

Distribution.—Arid regions of southern California and the peninsula of Lower California generally; southwestern Arizona.

Habits.—Like the typical form.

THE PRAIRIE RATTLESNAKE

Crotalus confluentus, (Say)

The average snake of this species is of moderate size, and not so stout of body as most rattlesnakes. Occasional specimens are six feet long.

Colouration.—Greenish yellow, or olive, with a row of large, round and well separated blotches of brown upon the back. There is usually a smaller and less distinct row of blotches on the side. The blotches of the back have a narrow, dark margin and outside of this is usually a narrow margin of white or yellow. Toward the tail the blotches fade into obscure transverse bands.

The head markings are important as they may alone be employed in distinguishing the species from the Pacific Rattlesnake, which it closely resembles.

The Rattlesnakes

There is a dark band *from beneath the centre of the eye* to the angle of the mouth. This is bordered both in the front and the rear by a yellow stripe, *the front stripe being narrow—the width of a single scale-row*. In comparing the heads of these species it will be noted that the Pacific Rattlesnake has the dark band commencing *behind the centre of the eye*, and the forward pale stripe much wider—*about the width of two scales*.

The eye plates are usually marked with two white or yellow lines, which run together and form a sharp point at the outer margin.

Dimensions.—Total Length of an adult, female specimen from Wyoming..... 38½ inches.
Length of Tail, ex. rattle..... 2½ “
Greatest Diameter..... 1½ “
Width of Head..... 1½ “
Length of Head..... 1½ “
Number of “rattles”—7 uniform segments.

Distribution.—The range is quite extensive and the writer quotes the careful summing up of the distribution as given by Dr. Leonhard Stejneger: *

“Broadly speaking, the Prairie Rattlesnake occupies the area bounded in the East by the ninety-sixth meridian and the Upper Missouri Valley; by the main divide of the Rocky Mountains in the West; by the thirty-third parallel in Texas and the Mexican boundary further west in the South; and by the fiftieth parallel in the North. In the Northeast its distribution appears to be limited by the watershed between the Missouri and the Red-River of the North, according to Dr. Coues (Bull. Geol. Surv. Terr. IV, 1878, p. 267), who collected numerous specimens along the Canadian border between this watershed and the crest of the Rockies. He also states that it is to be considered fairly common in the region of the Upper Missouri and Milk River and some of their Northern tributaries; its range thus extending some distance into the British Possessions, where Mr. James M. Macoun informs me that it is most abundant from Medicine Hat, on the Saskatchewan to the boundary.”

Habits.—In its general demeanour toward man, this very

* “The Poisonous Snakes of North America.” Report of the U. S. National Museum for 1893, pp. 337-487.

abundant species of the plains is a vicious reptile. Though it never actually attacks, it puts up such a show of fight that the attitude is far from reassuring to the uninitiated in the ways of rattlers. None of the rattlesnakes, large or small, throw as much energy into the fighting coil as this species. When surprised it flings its body into circular formation, raises the neck some distance from the loose coils in the form of a sharply oblique bow and jabs hurriedly at the enemy. So energetic is the stroke that the writer has seen a snake slide forward several inches. These antics soon give way to a good-natured laziness in captivity. Captive specimens are hardy and fond of mice and birds. A specimen in the writer's collection became so tame it would glide to the door of the cage and take a dead mouse from his fingers; the operation was in no way dangerous as the snake in crawling to the coveted morsel advanced with straightened neck and was unable to "strike." The mouse was seized very gently and at once swallowed. Mr. Walter Ralston, to whom the writer is indebted for many interesting snakes, had several tame specimens. They were in possession of their fangs, but Mr. Ralston handled them like his harmless serpents and with never a show of bad temper on the rattlers' part; he jokingly remarked that his snakes had forgotten how to rattle as they had not used their caudal appendages for many months.

The Prairie Rattlesnake is responsible for the oft-repeated tale of the fraternal relations between the prairie dogs and the rattler. In a way the story is true enough for the rattlesnake frequently takes refuge in the burrows of the rodents, but it instinctively seeks the deserted burrows as does the common little owl of the plains. No sensible rattlesnake will remain above ground and fight the human invader when a deep burrow, close at hand, offers secure retreat. Hence the human is incited to theory. He has noted a rattlesnake disappear into the burrow of a prairie dog. On the horizon are the outlines of the sentinel "dogs" of the town, watching the movements of the intruder, who jams the facts together in such a fashion that the snake becomes the inevitable inhabitant of the marmot colony, and the appearance of a burrowing owl a few minutes later results in the imaginary addition of another member to the "happy family."—Let actual conditions be understood: The rattlesnake is a wanderer and its presence in the prairie

The Rattlesnakes

dog colony has been prompted by a hungry stomach. It does not hesitate to prowl into a burrow and devour several of the young. It does not remain in the burrow for the warm, animal odour of the place warns it that the parent has but shortly left, and while it does not fear an encounter it craves a quiet place where it may assimilate the meal. Crawling forth into the sun again, it wanders about in search of a deserted burrow and into this it disappears for several days. It is at the mouth of this burrow, placidly sunning and awaiting the completion of digestion that the human observer sees the snake. Nearby may be another burrow, for some time deserted by the original occupants and now occupied by a family of owls. Nothing could be more incongruous or farther from harmony, than a mixture of snake, "dogs" and owls in the same burrow.

THE PACIFIC RATTLESNAKE

Crotalus oregonus, (Holbrook)*

Size rather smaller than the prairie rattlesnake. The greater number of specimens are under four feet in length. The conformation is much like that of the allied species.

Colouration.—Very similar to the prairie rattlesnake. The ground-colour is gray, pale brown or greenish. On the back are large, rounded spots, well separated and narrowly bordered with black; toward the tail these blotches fuse into the shape of transverse bands; the tail is more strongly barred with the darker colour than that of the other species.

Head markings.—The markings of the head appeal to the prairie rattlesnake, but may be readily employed to distinguish the present species. The dark band commences *behind* the centre of the eye and extends to the angle of the mouth—with *C. confluentus* it begins beneath the centre of the eye. The pale band in front of this darker one is much broader than with the prairie rattlesnake.

Although the large eye plates on the top of the head have symmetrical, pointed marks, which terminate at the outer margin, these are not vividly defined.

* Has erroneously been called *Crotalus lucifer*, (B. & G.). Because Holbrook's original figure portrayed a rhomb-like pattern, numerous writers have refused to accept it as representing this species, though Holbrook designated the locality, and the scalation of the head of the type specimen agrees with the description of *lucifer*.

The Rattlesnakes

Variations.—The ground-colour varies considerably. Some specimens are almost black. A specimen examined, from the Beaver Mountains, in Utah, is pale green, with sooty black saddles on the back and none upon the sides. The blotches contained none of the ground-colour as is usually the case.

Dimensions.—An adult specimen, from Beaver County, Utah, and having a rattle consisting of five uniform segments, showed the following measurements:

Total Length.....	34	inches.
Tail, exclusive of rattle.....	2½	"
Greatest Diameter.....	1½	"
Width of Head.....	1½	"
Length of Head.....	1½	"

Distribution.—The Pacific region, from southern British Columbia to southern California. Also occurs in Idaho, Nevada and Utah. It inhabits mountainous regions to an altitude of 11,000 feet.

Habits.—Similar to the prairie rattlesnake. It is hardy in captivity.

THE TIGER RATTLESNAKE

Crotalus tigris, (Kennicott)

The Tiger Rattlesnake attains a moderate length—seldom more than three and a half feet. Its conformation does not materially differ from that of the prairie and Pacific rattlesnakes.

Colouration.—Yellowish gray, with a series of small and not very distinct blotches on the back and on each side, for the forward third of the body; *on the latter two-thirds, these blotches fuse into regular cross-bands, producing a strongly barred effect.* There is usually a dark bar from the eye to the angle of the mouth.

Several specimens from the mountains of southwestern Arizona looked quite black upon a gross examination. Examined closely, the pale ground-colour appeared only as dull gray bars on the sides of the latter portion of the body.

Dimensions.—The largest specimen examined was forty inches long. Its proportions were rather more slender than the Pacific rattlesnake.

Distribution.—Desert mountains of Arizona, Nevada and southern California.

The Rattlesnakes

While the Tiger Rattlesnake has for some time been considered a very rare species, numerous records show it to be fairly common in the barren mountain ranges of the extreme Southwest. A collector in southern California says that these snakes live at a considerable elevation, but were not rare. To back up his claim, he sent five specimens East. Mr. Herbert Brown, of Yuma, Arizona, in a letter to the writer, says: "During the late overflows (1905) of the Colorado and Gila Rivers, the snakes were driven from the valley lands and could be had in any number on the higher benches. Black and yellow rattlers (*C. tigris*) were very abundant. They are scarcer now."

Habits.—The Tiger Rattlesnake is not a very vicious species—if its habits may be judged by eight or ten captive specimens. After a few weeks in captivity it becomes lazy and good-natured. Three specimens lived for about two years. They fed upon mice, young rats and birds.

THE HORNED RATTLESNAKE; "SIDE-WINDER"

Crotalus cerastes, (Hallowell)

While this is one of the smallest species of *Crotalus*, it is the most distinct, owing to the horn-like process over each eye, which is really an elongation of the upper eye-shield (*supraocular*). The body is stout, with strongly keeled scales—the three central rows of scales having highly-raised keels, of tubercular formation.

Colouration.—Pale brown, yellow, or pinkish, with a series of dull blotches, generally separated by white interspaces. On the sides are irregular rows of small black or brown spots. Most specimens have several black bars on the tail.

Dimensions.—The maximum length is about thirty inches. Following are the measurements of a rather small specimen, from the Colorado Desert:

Total Length	17½ inches.
Tail, exclusive of rattle.....	1½ "
Greatest Diameter.....	¾ "
Width of Head.....	¾ "
Length of Head.....	1⅜ "

Number of segments of rattle, five, including the original "button"—each of the segments successively larger, denoting a steadily increasing growth.



HORNED RATTLESNAKE, *Crotalus cerastes*



HEAD OF THE HORNED RATTLESNAKE

From all other rattlesnakes the present species is at once distinct. It is sometimes called the "Sidewinder," owing to its habit of progressing in a series of loops. A small desert species



GREEN RATTLESNAKE, *Crotalus lepidus*

Only a few specimens of this apparently rare serpent have been captured. All were from the immediate vicinity of the Mexican boundary, on either side.



PRICE'S RATTLESNAKE, *Crotalus pricei*

Another rare species, and of diminutive proportions. Lives in the mountain ranges near the Mexican boundary.

Distribution.—Desert areas of Arizona, southern Nevada, southwestern Utah and eastern California.

Habits.—In its methods of progression this very interesting snake differs from every other North American serpent. The remarkable fashion in which it loops its way over the desert sands is an exact reproduction of the motions displayed by the several species of vipers that inhabit the borders of the African and Arabian deserts.

When progressing in a very leisurely manner the Horned Rattlesnake glides almost in a straight line, as do all Rattlesnakes—very slowly, with head slightly raised and horizontal. It is when the creature quickens its gait that the movements become complicated and altogether unlike those of a serpent. The progression is by a series of large loops of the body thrown forward; one loop follows another with perfect symmetry of alternation, while the snake moves off at a sharply *oblique* angle to the direction in which the head is pointing and with such a degree of agility that the spectacle is not only grotesque, but bewildering. It in no way resembles a crawl; it is a *walking* movement.

Here we see Nature's admirable provision to enable a heavy-bodied snake to progress at some speed over desert sands. That this is the *only* fashion in which a thick-bodied snake could display agility on soft soil is well illustrated by the fact that these singular movements have been adopted by the vipers of the African deserts and again, far removed from them, by our one species of rattlesnake that inhabits the desert proper.

THE GREEN RATTLESNAKE

Crotalus lepidus, (Kennicott)

The smallest species of the genus. Its conformation differs from the other rattlesnakes as the body is quite slender, though the head is broad, flat and distinct from the neck. This species has twenty-three rows of scales.

Colouration.—Greenish-gray, or rich, dark green above, crossed at wide intervals by narrow, jet-black bands. The bands are usually bordered with pale, greenish-yellow. The abdomen is pinkish, or yellowish-white.

Immediately behind the head is a black blotch that is bluntly forked in front. Between the black bands on the body are

The Rattlesnakes

scattered scales that are tipped with black. There are practically no head markings, though the labial (lip) plates are paler than the upper portion of the head.

Dimensions.—Following are the measurements of a perfectly adult specimen, with a rattle of six uniform rings:

Total Length.....	23 $\frac{1}{2}$	inches.
Length of Tail, exclusive of rattle.....	1 $\frac{3}{8}$	"
Length of Rattle, 6 rings.....	$\frac{7}{8}$	"
Greatest Diameter.....	$\frac{3}{4}$	"
Width of Head.....	$\frac{3}{4}$	"
Length of Head.....	1	"

Distribution.—The range is quite extensive, though the species is rare, so far as known. Later records may extend the distribution. The few specimens in our museums have been taken along the Mexican boundary from Eagle Pass, on the Rio Grande, in Texas, to Yuma, Arizona. The most northerly record of capture is from a point not far west of Socorro, New Mexico.

Through the kindness of Dr. Samuel Garman and Mr. Thomas Barbour, the writer has examined and photographed (the specimen figured) one of these snakes captured in the San Blas Mountains, in the state of Chihuahua, Mexico—but a short distance south of the boundary line.

The range of the species into Mexico is not known.

Habits.—The species inhabits mountainous areas.

PRICE'S RATTLESNAKE

Crotalus pricei, (Van Denburgh)

Next to the green rattlesnake, the present species is the smallest of the genus. Price's Rattlesnake is quite stout of body. On gross examination it appears strikingly like the Northern massasauga, (*Sistrurus catenatus*), in size, form, colouration and shape of the rattle. The scales are in twenty-one rows.

Colouration.—Grayish-brown, with two series of closely set, small, seal-brown blotches on the back—these faintly margined with white. On some specimens the spots fuse together in the form of transverse blotches; this tendency is shown on the latter part of the body with most specimens. On the tail the markings assume, above, the form of rings.

The Rattlesnakes

The head is grayish above, with a large *lyre* or U-shaped blotch at the base. From behind the eye to the base of the head, is a broad black band, bordered beneath by white and thus greatly intensified. The abdomen is slaty gray.

Dimensions.—Following are the measurements of an adult specimen, with a rattle composed of six uniform segments.

Total Length.....	21½	inches.
Tail, exclusive of rattle.....	1½	"
Length of Rattle, 6 rings.....	¾	"
Greatest Diameter.....	7/8	"
Width of Head.....	¾	"
Length of Head.....	1½	"

Distribution.—As the species is very rare the limits of its range are not definitely known. It was discovered in 1895 in the Huachuca Mountains in Arizona, and since that time, barely a dozen specimens have been taken in the United States. The species probably ranges from southern Arizona well into Mexico.

Through the kindness of Dr. Samuel Garman and Mr. Thomas Barbour, the writer has examined a specimen from the San Blas Mountains, in Chihuahua, Mexico, not far from the boundary.

Habits.—Nothing is known of the habits beyond the disposition to frequent mountainous places and at a considerable elevation.

THE WHITE RATTLESNAKE

Crotalus mitchellii, (Cope)

Owing to its pallid colouration, snakes of this species might be confused with pale specimens of the Western diamond rattlesnake, (*C. atrox*). The similarity, however, is in the whitish colour only. From all the other species of North American *Crotalus*, the White Rattlesnake differs in an arrangement of the head scales, thus:

The large plate in front of the nostril (anterior nasal) is separated from the nose plate (rostral) by small scales. With the other species of Rattlesnakes it will be observed that the shield in front of the nostril is in contact with the nose plate (*rostral*).

Colouration.—Grayish-yellow or pinkish, the body profusely sprinkled with brown dots. Upon the back these dots are crowded into the form of a series of blotches, which, although not exactly rhomb-like in character, impart much the same effect as the

The Rattlesnakes

pattern of the Western diamond rattlesnake. This similarity is heightened by the tail; this is white with black rings. There is a yellowish band from in front of the eye to the angle of the mouth.

On most specimens the markings are very obscure, but the writer received one specimen from San Diego County, California, so strongly marked that it was momentarily mistaken for a specimen of the *Crotalus atrox*—the Western diamond rattlesnake.

A bright red specimen has been taken in Canyon Prieto, not far from Fort Whipple, Arizona. This was given the name *pyrrha*, by Prof. Cope. As no other specimens have been taken since its capture (1866) it can hardly be considered anything but an individual variation in colour.

Dimensions.—The length of a mature specimen seems to be about three and a half feet. The conformation of the head and body is like the Western diamond rattlesnake.

Distribution.—Desert mountains, though not at a great altitude, of Lower California, southern California, southern Arizona and extreme northwestern Mexico.

Mr. Herbert Brown has given the writer the following note about the species:

"In the Tinajas Altas Range, a small, detached mountain, about 70 miles southwest of here (Yuma), there is a white Rattlesnake. I submitted a specimen to Dr. Van Denburgh, of San Francisco, California. He says it is *Crotalus mitchellii*. They are slightly marked with dark across the middle of the back, but otherwise the white or gray is solid. Dr. W. J. McGee to whom I am indebted for the specimen, killed two of them while in the range. He said that when coiled they looked like bunches of white cotton. I believe I have seen them in the Death Valley country."

Habits.—But one living example has been observed by the writer. It was a nervous snake, and kept its pale, straw-coloured rattle always ready to be shaken upon the slightest disturbance. It steadily refused food and lived but a few months. Observations upon a single specimen of a creature so far removed from its environment are of but little value. To describe such a snake as stupid would be but to theorise over the actions of a wild brute suddenly removed from everything natural, stunned and grieving from the change. What we frequently regard as "stupidity"

The Rattlesnakes

on the part of a dumb brute, is its constant longing for liberty, overcoming all ideas of exercise and appetite. Unless we can to a considerable extent copy an animals environments, thence compare the actions of numerous individuals, we cannot with certainty describe *habits*.

INDEX

- Abaster erythrogrammus*, 366
 Alabama Terrapin, 38
 Allen's Snake, 264
 Alligator, 84
 Alligator Lizard, 102
Alligator mississippiensis, 84
 Alligator Turtle, 15
 American Crocodile, 89
Amphiarctus inornatus, 272
Ancistrodon bilineatus, 415
 contortrix, 420
 piscivorus, 415
Ancistrodon, Key to, 415
Anguilla, 160
Aniella pulchra, 168
Aniellida, 168
 Annulated Snake, 389
Anolis carolinensis, 102
 Anti-Venine, 408
 Anti-venomous Serum, 408
 Arizona Ringed Snake, 357
Aromochelys carinatus, 22
 odoratus, 20
 tristycha, 21
Aromochelys, Key to, 18
 Banded Chicken Snake, 308
 Banded Ground Snake, 331
 Beaded Lizards, 169-177
Bipes, 191
Bipes canaliculatus, 192
 Black-banded Snake, 390
 Black-headed Snake, Eisen's, 391
 Slender, 391
 Texas, 391
 Blacksnake, 279
 Black Swamp Snake, 263
 Blanding's Turtle, 56
 Blind Snake, California, 210
 Texas, 210
 Blind "Worm," 168
 Blue-tailed Lizard, 196
 Boa, Rosy, 211
 Rubber, 211
 Three-lined, 211
 Boas, Key to No. American, 210-211
Boida, 210
 Box Turtle, Baur's, 63
 Common, 59
 Florida, 63
 Large, 62
 Painted, 58
 Three-Toed, 63
 Box Turtles, Key to, 55
 Brown, Arthur Erwin, 356
 Brown Lizard, 164
 Brown Snake, 267-269-271-272-332
 Brown Snakes, Key to, 266
 Bull Snake, Arizona, 320
 Common, 318
 Pacific, 320
 Bull Snakes, Key to, 315-316
Callisaurus, Definition of, 116
Callisaurus draconoides, 117
 Cape Striped Lizard, 185
Carphophis amarus, 370
Cnemidophorus coccinea, 373
 Cerros Island Striped Lizard, 183
 Chain Snake, 359
 Chameleon, American, 102
Charina botia, 211
 brachyops, 211
 Checkered "Adder," 342
 Chelonia, Classification of, 3
Chelonia imbricata, 9
 mydas, 8
Chelonida, 7
Chelopus guttatus, 50
 insculptus, 53
 marmoratus, 52
 muhlenbergii, 51
Chelopus, Key to, 49-50
Chelydra serpentina, 12
Chelydrida, 11
 Chicken Turtle, 34
Chilomeniscus cinctus, 373
 ephippicus, 372
Chrysemys alabamensis, 38
 belli, 33
 concinna, 36
 elegans, 40
 floridana, 37
 hieroglyphica, 36
 marginata, 33
 mobilensis, 38
 nebulosa, 41
 picta, 32
 reticulatus, 34
 rubriventris, 38
 scabra, 39
 texana, 40
 troostii, 35
Chrysemys, Key to, 30-32
 Chuckawalla, Common, 111
 Island, 111
 Chuckawallas, Key to, 111
 Chunkhead, 420
Cinosternida, 17
Cinosternum bauri, 25
 flavescens, 25
 henrici, 26
 integrum, 26
 louisiana, 24
 pennsylvanicum, 23
Cinosternum, Key to, 19
Cistudo bauri, 63
 carolina, 59
 major, 62
 ornata, 58
 triunguis, 63
Clonophis kirilandi, 261
Cnemidophorus grahami, 187
 gularis, 187
 hyperythrus, 185
 labialis, 188
 maximus, 186
 sericeus, 186
 sexlineatus, 188
 tessellatus, 186
 Coachwhip Snake, 286
 Collared Lizard, 113
 Colour Changes of Lizards, 103-104
 Coluber, Black, 303
 Davis Mountain, 299
 Emory's, 298
 Four-banded, 308

Index

- Coluber* Gray, 307
 Lindheimer's, 306
 Red, 300
 Red-headed, 296
 Smooth-scaled, 314
Coluber emoryi, 298
 guttatus, 300
 obsoletus, 303
 variety *confinis*, 307
 variety *lindheimeri*, 306
 quadrivittatus, 308
 subocularis, 299
 vulpinus, 296
 Colubers, Key to, 295-296
 Common Spotted Lizard, 120
Contia episcopa, 331
 variety *isozona*, 331
 missis, 332
 occipitalis, 332
 taylori, 331
Contia, Key to, 328
 Cooter, 36
 Cope's Desert Lizard, 118
 Cope's Lizard, 182
 Copperhead Snake, 420
 "Coral Snake," 350
 Coral Snake, Eastern, 396
 Sonoran, 401
 Coral Snakes, Key to, 396
 Corn Snake, 300
 Cotton-mouth Snake, 415
 Crocodilians, Key to No. Am. species, 83
Crocodylidae, 83
Crocodylus americanus, 89
Crotalinae, List of American, 412-413
Crotalus adamanteus, 447
 atrox, 452
 ruber, 455
 scutulatus, 454
 cerastes, 460
 confluentus, 458
 horridus, 441
 lepidus, 461
 mitchelli, 463
 molossus, 440
 oregonus, 458
 pricei, 462
 tigris, 459
Crotaphytus collaris, 113
 reticulatus, 115
 wislizeni, 115
Crotaphytus, Key to, 112-113
 Crowned Snake, 391
Ctenosaura hemilopha, 107
 multispinis, 107
Cyclophis astivus, 322
 DeKay's Snake, 267
 Desert Fauna, 159
Diadophis amabilis, 337
 punctatus, 334
 regalis, 338
Diadophis, Key to, 333-334
 Diamond-back Terrapin, 47
Dipsadomorphinae, 386
Dipsosaurus dorsalis, 109
 Dog-nosed Snake, 372
 Elapine Snakes, 392-402
Elaps euryzanthus, 401
 fulvius, 396
 Elaps, Key to, 396
Emys, 55
Emys blandingii, 56
Erythrolamprus imperialis, 390
Eublepharis variegatus, 100
Euchirotes, 191
Euchirotidae, Key to Genera, 191
Eumeces anthracinus, 199
 brevilineatus, 200
 egregius, 199
Eumeces gilberti, 198
 guttulatus, 200
 leptogrammus, 197
 multivirgatus, 196
 obsoletus, 198
 pachyurus, 200
 pluvialis, 200
 quinclineatus, 196
 septentrionalis, 199
 skullonianus, 198
 tetragrammus, 199
Eutamia butleri, 223
 elegans, 225
 biscutata, 229
 couchi, 230
 infernalis, 227
 marciana, 229
 vagrans, 228
 aques, 230
 megalops, 221
 multimaculata, 239
 proxima, 220
 radix, 222
 rufopunctata, 240
 sackeni, 219
 saurita, 216
 sirtalis, 231
 leptocephala, 239
 ordinatus, 237
 parietalis, 237
 pickeringii, 238
Eutamia elegans, Key to Varieties, 225
Eutamia, Key to Species, 215-216
Eutamia sirtalis, Key to Varieties, 232-234
Farancia abacura, 367
 Fence Lizard, 102
Ficimia cana, 372
 Flat-Nosed Snake, Brown's, 293
 Graham's, 292
 Peninsula, 293
 Fox Snake, 296
 Garman's Brown Snake, 272
 Garman, Dr. Samuel, 265
 Garter Snake, Arizona, 221
 Brown, 230
 Butler's, 223
 Common, 231
 Green, 228
 Marcy's, 229
 Narrow-headed, 239
 Pickering's, 238
 Plains, 222
 Red-barred, 237
 Red-spotted, 240
 Single-striped, 227
 Spotted, 237
 Washington, 229
 Western, 224
 Western Spotted, 239
 Garter Snakes, Key to, 215-216
 Gecko, Banded, 100
 Cape, 99
 Reef, 99
 Tubercular, 98
 Warty, 98
Geckonidae, Key to No. Am. species, 98
 Geographic Terrapin, 43
Gerrhonotus imbricatus, 165
 kingii, 164
 liocephalus, 164
 multicarinatus, 161
Gerrhonotus, Key to, 161
 Gila Monster, 172
 Gilbert's Lizard, 182
 Glass "Snake," 165
Glaucenia dulcis, 210
 humilis, 210
Glaucenia, Key to No. Am. species, 210
Glaucosida, 209
 Gopher Snake, 276

Index

- Graham's Lizard, 187
 Grass Snake, 324
 Gray Rat Snake, 307
 Green Lizard, 102
 Green Snake, Keeled-Scaled, 322
 Smooth-Scaled, 324
 Green Turtle, 8
 Green Whip Snake, 322
 Ground Lizard, 203
 Ground Snake, 267-269-271-272
 Ground Snake, Arizona, 373
 Red and Black, 372

Haldea striatula, 271
 Harlequin Snake, 396
 Harp Turtle, 6
 Hawk's-bill Turtle, 9
Heloderma horridum, 176
 suspectum, 172
Heloderma matida, 169
Hemichirotes, 191
 Henshaw's Lizard, 183
Heurodon, Key to, 378
 nasicus, 384
 platyrhinus, 378
 simus, 383
 Hieroglyphic Terrapin, 36
 Highland Moccasin, 420
 Hog-nosed Snake, Black, 382
 Common, 378
 Southern, 383
 Western, 384
Holbrookia elegans, 120
 lacerata, 120
 maculata, 120
 propinqua, 120
 texana, 120
Holbrookia, definition of, 116
 Key to, 120
 Horned Lizard, Ashy, 157
 Cerro, 151
 Ditmars's, 154
 Douglass's, 148
 Goode's, 158
 Hernandez's, 148
 Little, 156
 MacCall's, 159
 Mexican, 149
 Pacific, 152
 Painted, 148
 Regal, 150
 Smooth, 158
 Texas, 153
 Horned Lizards, Key to, 146-147
 Horned "Toads," 143-159
 House Snake, 300-342
Hypsiglena ochrorhyncha, 329

 Iguana, Black, 107
 Cape, 107
 Desert, 109
 Spiny-tailed, 107
 Iguanas, Key to No. Am. species, 107
 Indigo Snake, 276

 Jew's-harp Snake, 389

 Keel-backed Lizard, 109
 Keeled Lizard, 161
 Kemp's Loggerhead Turtle, 8
 King's Lizard, 164
 King Snake, Blotched, 355
 Boyle's, 363
 Brown, 354
 California, 363
 Common, 350
 Davis Mountain, 356
 Mexican, 353
 Red, 348
 Ringed, 348-357
 Say's, 358
 Scarlet, 350
 King Snake, Yellow-bellied, 355
 King Snakes, Key to, 340-341
 Kirtland's Snake, 261

 Lacertilia, Classification of, 95-96
 Large Striped Lizard, 186
 Leather-back Turtle, 6
 LeConte's Snake, 375
 Leopard Lizard, 115
 Lesueur's Terrapin, 44
Lichanura roseofusca, 211
 trivirgata, 211
Liodytes alleni, 264
Liopeltis vernalis, 324
 Loggerhead Turtle, 7
 Long-necked Terrapin, 34
 Luth, 6
Lygosoma laterale, 203
Lysoptychus lateralis, 126

Macrochelys lacertina, 15
Malacoclemmys geographica, 43
 kohli, 46
 lesueurii, 44
 oculifera, 47
 palustris, 47
 pulchra, 46
Malacoclemmys, Key to, 42-43
 Map Turtle, 43
 Mexican Beaded Lizard, 176
 Mexican Spotted Lizard, 120
 "Mimicry," 395
 Milk Snake, 342
 Miscellaneous Keeled-scaled Snakes, 261
 Miscellaneous Smooth-scaled Snakes, 327
 Miscellaneous Small Snakes, Key to, 327
 Mobile Terrapin, 38
 "Moccasin"—harmless, 257
 Moccasins, 414-425
 Mountain Black Snake, 303
 Mouse Snake, 300
 Mud Snake, 263-264
 Mud Turtle, Arizona, 26
 Banded, 25
 Baur's, 25
 Common, 23
 Louisiana, 24
 Mexican, 26
 Yellow-necked, 25
 Mud Turtles, Key to, 19
 Muhlenberg's Turtle, 51
 Musk Turtle, Common, 20
 Keeled, 22
 Southern, 21
 Musk Turtles, Key to, 18

 Ocellated Desert Lizard, 118
 Ocellated Terrapin, 47
Ophibolus alternus, 356
 calligaster, 355
 doliatus, 348
 clavatus, 346
 coccineus, 350
 gemilis, 348
 triangulus, 342
 getulus, 359
 boylei, 363
 californica, 363
 sayi, 358
 micropholis, 353
 rhombomaculatus, 354
 sonatus, 357
 Ophibolus, Key to the Species, 340-341
 Ophidia, Classified List of, 207-208
Ophisaurus ventralis, 165
 Opisthoglyph Snakes, Key to, 388
 Opisthoglyphs, 386
 Pacific Ground Snake, 332
 Painted Terrapin, 32
 Peninsula Terrapin, 41
Phrynosoma calisarianum, 157
 cerroense, 151

Index

- Phrynosoma coronatum*, 152
cornutum, 153
dummaris, 154
goodii, 158
maculatus, 159
modestum, 156
orbiculare, 149
platyrhinum, 158
regale, 150
Phrynosoma, Key to, 146-147
Phyllodactylus tuberculosus, 98
unctus, 99
Phyllorhynchus browni, 293
decurtatus, 293
Pilot Black Snake, 303
Pilot Snake, 420
Pine Snake, 316
Pituophis catenifer, 320
melanoleucus, 316
saysi, 318
bellona, 320
Pituophis, Key to, 315-316
Pit Vipers, 403
Plated Lizard, 165
Plated Lizards, Key to, 161
Poison Apparatus of Pit Vipers, 404
Poison of Elapine Snakes, 394
Poison of *Heloderma*, 170
Poison of Ophioglyphs, 387
Pond Terrapin, 32
Pond Turtle, 50
Queen Snake, 243
Racer, Banded, 288
Black, 279
Green, 285
Ornate, 290
Pink-bellied, 288
Red, 288
Striped, 289
Yellow-bellied, 285
Racers, Key to, 274-275
Race Runners, 184
Rainbow Snake, 366
Rat Snakes, Key to, 295-296
Rattlesnake, Banded, 441
Black-tailed, 440
Diamond-back, 447
Edward's, 438
Green, 461
Horned, 460
Massasauga, 436
Mountain Diamond, 454
Pacific, 458
Pigmy, 433
Prairie, 455
Price's, 462
Red Diamond, 455
Sidewinder, 460
Tiger, 459
Timber, 441
Western Diamond, 452
White, 463
Rattlesnakes, Distribution of, 428
Rattlesnakes, Key to, 439-440
Rattlesnake, Pilot, 420
Rattle, Structure and Use of, 429
Red-bellied Snake, 269-307
Red-bellied Terrapin, 38
Red Chicken Snake, 300
Red-headed Lizard, 196
Red Milk Snake, 346
Red-necked Terrapin, 36
Red-spotted Desert Lizard, 118
Remedies for Snake Bite, 406
Reticulated Lizard, 115
Reticulated Terrapin, 34
Rhadinea flavilata, 330
Rhinoceros elegans, 314
Rhinoceros floridae, 193
Rhinoceros lecontei, 375
Ribbon Snake, Eastern, 216
Southern, 219
Western, 220
Ringed Ground Snake, 332
Ring-necked Snake, Eastern, 334
Sonoran, 338
Western, 337
Ring-necked Snakes, Key to, 333-334
River's Lizard, 183
Rock Snake, 329
Round-spotted Desert Lizard, 118
Salvadora grahamia, 292
Sauromalus ater, 111
hispidus, 111
Scarlet Racer, 300
Scarlet Snake, 373
Sceloporus biserialis, 135
collaris, 140
clarkii, 131
gracilis, 141
orcutti, 133
spinatus, 134
thayeri, 139
torquatus var. *poinsettii*, 140
undulatus, 137
var. *consobrinus*, 136
var. *occidentalis*, 139
vandenburgianus, 136
variabilis, 137
yarrovi, 135
Zosteromus, 133
Sceloporus, Key to the Species, 128-130
Scincida, 195
"Scorpion," Lizard, 196
Sea Turtles, Key to, 5
Semi-box Turtle, 56
Seminatrix pygmaea, 263
Sharp-nosed Snakes, Key to, 369-370
Short-tailed Snake, 329
Sibon septentrionalis, 389
Sistrurus catenatus, 436
edwardsi, 438
miliarius, 433
Sistrurus, Key to, 433
Six-lined Lizard, 188
Six-lined Race Runner, 188
Skink, Black, 197
Blue-spotted, 200
Blue-tailed, 196
Black-banded, 199
Brown-backed, 203
Cope's, 200
Five-lined, 196
Florida, 199
Gilbert's, 198
Hayden's, 197
Many-lined, 196
Pluvial, 200
Red-headed, 196
Short-lined, 200
Skilton's, 198
Sonoran, 198
Texas, 199
Slender Spotted Lizard, 120
Small-scaled Swifts, Key to, 123-125
Snake Bite, Records of, 409
Treatment of, 406
Snake Poison, Effects of, 407
Snakes, Classified List of No. Am., 207-208
Snapping Turtle, Alligator, 15
Common, 12
Snapping Turtles, Key to, 12
Soft-shelled Turtle, Brown, 78
Emory's, 78
Southern, 74
Spiny, 77
Soft-shelled Turtles, Key to, 73
Southern Milk Snake, 348
Spharodactylus notatus, 99
Sphargida, 6

Index

- Sphargis coriacea*, 6
Spilotes corais conperi, 276
 Spiny Swifts, Key to, 128-130
 Spiny-tailed Iguana, 106
 Spotted Chicken Snake, 307
 Spotted Lizards, Key to, 118
 Spotted Race Runner, 187
 Spotted Turtle, 50
 Stejneger, Dr. Leonhard, 404
Stilosoma extenuatum, 329
Storeria dekayi, 267
occipitamaculata, 269
 Storer's Snake, 269
 Striped House Snake, 308
 Striped Lizards, 184-189
 Striped Snakes, Key to, 215-216
 Striped Swamp Snake, 262
 Swamp Snake, 264
 Swift, Banded, 133
 Black, 125
 Black-tailed, 125
 Clark's, 131
 Collared, 140
 Common, 137
 Four-barred, 123
 Long-tailed, 125
 Mearns's, 123
 Olive, 124
 Orcutt's, 133
 Ornate, 124
 Pacific, 130
 Palmer's, 124
 Sage Brush, 141
 Spiny, 134
 Stansbury's, 124
 Striped, 140
 Thayer's, 139
 Three-barred, 123
 Van Denburgh's, 136
 Variable, 137
 Western, 135
 White-bellied, 125
 Yarrow's, 135
 Yellow-banded, 136
Tantilla coronata, 391
eisens, 391
gracilis, 391
nigricaps, 391
Tantilla, Key to Species, 391
 Taylor's Snake, 331
Tesida, 184
 Terrapin, Alabama, 38
 Barred, 36
 Baur's, 46
 Bell's, 33
 Chicken, 34
 Cumberland, 40
 Diamond-back, 47
 Eastern Painted, 32
 Florida, 37
 Geographic, 43
 Hieroglyphic, 36
 Kohn's, 46
 Lesueur's, 44
 Long-necked, 34
 Mobile, 38
 Ocellated, 47
 Peninsula, 41
 Red-bellied, 38
 Red-necked, 36
 Reticulated, 34
 Texas, 40
 Troost's, 35
 Western Painted, 33
 Yellow-bellied, 39
 Terrapins, Classification of, 28
 Definition of Genera, 29
 Tessellated Lizard, 186
Testudo agassizii, 69
berlandieri, 71
polyphemus, 66
Testudo, Key to No. Am. species, 65-66
 Texas Terrapin, 40
Thalassochelys caretta, 7
kempi, 8
 Thunder Snake, 359
 Tiger Lizard, 187
 Tortoise, Agassiz's, 69
 Berlandier's, 71
 Gopher, 66
 Treatment of Snake Bite, 406
Trimorphodon lyrophanes, 389
Trionyx emoryi, 78
 ferox, 74
 muticus, 78
 spinifer, 77
 Troost's Terrapin, 35
Tropidoclonium lineatum, 262
Tropidonotus clarki, 245
 compressicaudus, 246
 cyclopinus, 255
 fasciatus, 246
 erythrogaster, 250
 sipidon, 251
 transversus, 254
 grahami, 244
 leberis, 243
 rhombifer, 254
 rigidus, 244
 taxispilotus, 256
 validus, 245
Tropidonotus, Key to, 241-242
 Trunk Turtle, 6
 Turtles, Classification of No. Amer., 3
 Two-footed Worm Lizard, 192
 Two-headed Snake, 211
Uma inornata, 118
 notata, 118
 rufopunctata, 118
 scoparia, 118
Uma Key to, 118
Uta graciosa, 125
 levis, 124
 mearnsii, 123
 nigricauda, 125
 ornata, 124
 palmeri, 124
 parvisculata, 125
 repens, 123
 stansburiana, 124
 symmetrica, 125
 thalassina, 123
Uta, Key to, 123-125
 Van Denburgh, John J., 179
 Van Denburgh's Striped Lizard, 186
Verticaria, 185
 Viperine Snakes, 403
Virginia elegans, 273
 valeria, 272
 Virginia's Snake, 273
 Water Pilot, 256
 Water "Rattle," 256
 Water Snake, Banded, 246
 Blotched, 254
 Brown, 256
 Clark's, 245
 Common, 257
 Diamond-back, 254
 Flat-tailed, 246
 Graham's, 244
 Green, 255
 Red-bellied, 250
 Striped, 244
 Western, 245
 Water Snakes, Key to, 241-242
 Western Painted Terrapin, 33
 Western Pond Turtle, 52
 Whip Snake, 281
 Whip-tailed Lizard, 187
 White-bellied Lizard, 120

Index

White Gopher Snake, 316
Wood Turtle, 53
Worm-like Lizards, 190-194
Worm Lizard, 168-193
Worm Snake, 271-272-370
Worm "Snake," 168

Xantusia gilberti, 182
 henshawi, 183
 picta, 182
 riveriana, 183
 vigilis, 179
Xantusia, Key to, 178-179
Xantusiida, 178
Xantus's Lizard, 179

Yellow-bellied Terrapin, 39

Yellow Chicken Snake, 308
Yellow Gopher Snake, 318-320
Yellow Ground Snake, 331
Yellow-lipped Snake, 330
Yellow Rat Snake, 308

Zamenis constrictor, 270
 flaviventris, 285
 flagelliformis, 286
 frenatum, 288
 piceus, 288
 lateralis, 288
 tanaiatus, 289
 ornatus, 290
Zamenis, Key to, 274-275
Zebra-tailed Lizard, 117-120

